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EDITORIAL NOTES—GAS, &c.

Education and Training of Engineers.

THERE was a veritable rhetorical torrent at the conference at the Institution of Civil Engineers last Wednesday and Thursday upon the subject of the education and training of engineers. It is a topic, well worn though it be, of never-ceasing interest. On this occasion, it attracted men from all parts of the country—professors from our Universities and other centres of learning and of education, and leaders in the engineering world; and the debates were well-sustained on the numerous short papers that paved the way for discussion. Whether any good will issue from it all, it is difficult to say at present; but a conference like this is bound to exert influence of some kind. Having, however, read the papers presented and heard some of the speeches—what has been read and what was heard we acknowledge as the limitations of the application of this expression of opinion—it must be said that there was little that could be characterized as new, but there was much that showed the great diversity of opinion that reigns even among men whose experience is of the order that entitles their views to respect, if not always to acceptance. The subject is such a trite one that it is not to be wondered at that all that was new was merely the mode of expressing the old ideas. We have therefore some little misgiving as to anything tangible really emerging from the conference, other than an amount of indirect influence, through the rooting in fresh places of thoughts and ideas, that perhaps, differently expressed, have not previously impressed themselves on the same minds.

Naturally, it is the desire of all that the best methods should be applied to the education and training of men for the engineering profession; but, as we have said before, and say again, with the view endorsed by men of high standing—academically, and in the engineering profession—it is impossible to design any course of education and training that will fit all men and all circumstances. We do not want the science and art of engineering to become a stereotyped something through the shaping of the future practitioners in one mould fashioned by a body of men, no matter how eminent they may be. Standardization of material has proceeded apace; but the standardization of the men of engineering is the last thing that should be sought. The science and art of engineering would suffer enormously were such a thing to happen—suffer immeasurably more than it is doing now through the diverse methods that are adopted in the education and training of its men. Engineering wants the best men; and the best men are those of mental capacity and discipline and active thought. Such men have their foundations laid by a liberal general education; and ultimately they are the men who are, as a rule, capable of taking a broad outlook. There was general agreement in this matter. There was also agreement—generally, but not entirely—that the best engineer is the man who is educated in the theory and principles of his profession as well as in the practical work. These dual courses of training are as essential for the man as for his work, as there is not the slightest question about it that, in the competition of the times, the men of the broadest qualifications will squeeze out men of narrower qualifications, and leave them groping about for employment at the foot of the professional ladder. Development is the natural order of things; and engineering progress demands development in the workers' qualifications. We see it all around; and it is a process that must continue.

But there being, generally speaking, quite a consensus of opinion as to the correctness of the combination of education in theory and principles and of practical training, we had at this conference the learned masters coming into conflict as of old, and as they ever will do. But if their constant conflict does something to amend the deficiencies of the educational centres devoted to engineering, so much the better. Those deficiencies are acknowledged. There was a distinct majority view among the readers of the papers and among speakers in the discussions that, at the centres of learning, the theory and principles of engineering should be taught, without any attempt at specialization. That would make a very good recommendation for the Universities and Colleges that are devoted to the general training of engineers, and have not facilities for specialization work. We think, however, the advocates of the lines of work in this direction had, at the conference, too much their own way, to the detriment of such places as the Leeds University, where there are facilities for specialization. At the same time, specialization of the character in mind is over and above the general education in theory and principles that is fundamentally necessary, both in the interests of the man and of engineering. There, however, we again have conflict. There are those who believe that education in theory and principles can be systematized along straight lines without consideration for the human material (which is not all of one kind) to which it is to be applied. There are others who think it cannot be, with profit to all; and we are among the latter.

Another point upon which there is conflict of opinion is the old one as to whether education in theory and principles should precede or succeed practical training. There was, however, a distinct majority of expressions in favour of the educational work taking precedence in order—by no means was it submitted in value—of the practical training. We cannot understand the reasoning of those who think to the contrary in the case of the normal man. It is surely better that there should be continuity between school studies and the study of engineering theories and principles than that, following ordinary school life, there should be three years' or so in the workshops, with the expectation that succeeding the practical work the young engineer should once again discipline his mind to the work of the college. We are much in accord with the author of one of the papers who said, in effect, you must come directly in contact with work to understand it; but you will understand it all the better from knowing the principles underlying it. The young engineer "will enter on his practical training, with his mind "disciplined and developed by his study of science; and ex-"perience comes most quickly and with most lasting effect "to one who can place each item as it presents itself in its "proper place in a connected system of knowledge based "upon general laws, the workings of which he has learned "to recognize." Thus spoke Dr. Archibald Barr; and it expresses the view of most of those who have given extended and serious thought to the matter. But, in a measure, there are indications of antagonism between the professorial view and that of the chiefs of certain of the large engineering works. They both appear to want to commence moulding the young engineers as early as possible. The compromise suggested, of alternations of college study and of practical training (the "sandwich" system), is good; but the difficulties are many, so many indeed that it would not be generally workable. But much could be done in this way, and much could be done in the improvement in engineering education and training, by greater practical sympathy on the part of employers towards the educational centres that lay themselves out specially for this work.

There is a point that received little consideration at the conference; and it is one that was pithily expressed by Mr. J. W. Horne in the concluding words of his paper, which words constitute a plea for a scheme to ensure that "poverty "or social circumstances shall not prevent access to the "highest forms of training that the community can pro-"vide." Considering the men who have made the history of engineering, it is inexplicable that this aspect of the subject should be kept so much in the background. A need of the profession it was said during the conference is "men "of widely different qualifications." It is sincerely hoped

that, as a result of this conference, nothing will be done to close the door against ability and brains, though poverty prevents the grasping of the opportunities enjoyed by those better favoured with the wherewithal to take full advantage of them.

There were many other subjects touched upon during the conference; but we limit ourselves to these comments upon some of the more salient ones. Beyond these comments, there is no intention to report in these pages the proceedings, at which the gas industry was represented by the President of the Institution of Gas Engineers (Mr. R. G. Shadbolt) and others. It may be expected that something will be done in the way of the preparation of a report upon the conference; and then there will be an opportunity of reverting to the matter. But if anything in the nature of a scheme or recommendations eventuate, it is hoped that it or they will be framed with the latitude that men of different mental capacity, ability, and talent require, and men of different social standing need, in order to give opportunity to all and preference to none in fighting for position and distinction. The story in engineering that the past has to tell holds eloquent warning against closing the door in a manner that will shut out widely differing qualifications.

The Meeting of the German Association.

THE general meeting of the German Association of Gas and Water Engineers which was held last week at Dresden attracted at least as large a number of technical men as the annual gatherings of the Association usually do. Dresden is always a favourite town; and this year there was the additional feature of a large and well-organized exhibition devoted primarily to matters connected with hygiene. The programme of the meeting was carried through with the customary success, which is a no mean tribute to the local Organizing Committee, when it is remembered that they had to make arrangements for upwards of 1200 participants. There was, however, somewhat further division of the members into groups, for visits to works and excursions, than is usually the case; and doubtless if the numbers attending the meeting in future years continue to increase as in the past, this division into groups will have to be resorted to at subsequent meetings to an even greater extent.

The three days' sessions for technical proceedings were held under the chairmanship of Herr Prenger, the President of the Association, and the distinguished Manager of the gas, water, and electricity works of the City of Cologne. His geniality and great ability are well known to English gas engineers, through (*inter alia*) the visit which members of the German Association paid to English gas-works last autumn, with him as their Chairman and spokesman. In his Inaugural Address at last week's meeting, he recalled the pleasure it had given him and his colleagues to meet their English *confrères*, and said that the hospitality which was then extended to them would always remain in their memories.

The papers read at the meeting, and referred to in our special representative's report of the proceedings in another part of the "JOURNAL," were perhaps not of quite so interesting, and certainly not of so controversial, a character as in some past years. Attention was very properly drawn, however, in an exhaustive paper by Herr Blum, Managing-Director of the "Bamag" Company, to the great development in Germany in recent years of the system of supplying outlying townships and villages with gas, which is in the first instance forced under high pressure from the nearest large town gas-works to a governor and distributing station in the district to be supplied. This system of high-pressure gas distribution to a distance is the complement of the system of conveying electricity by overhead high-tension conductors from central works to distant communities. Germany has now fairly fully developed a system of cross-country gas supply which is a very serious rival to the similar supply of electricity which, it must in justice be admitted, has in the past proved a great boon to outlying works and villages in that country. The movement indicates a further step in the direction of the centralization of gas manufacture and supply. There is clearly not the same scope for the developing of this system of high-pressure distribution in Great Britain as in Germany and other parts of the Continent, since the distances between towns are smaller here, and the facilities for obtaining a supply of gas are already greater. Mr. Körting dealt, with the mind of a business man as well as of a gas engineer, with the difficult problem of the production and disposal of gas coke to the best advantage of the gas undertaking. Unfortunately, English readers of his paper, of which a full summary appears elsewhere, will not reap so much advantage from his suggestions as will German gas managers, for the reason that competition with gas coke is of a different character in the two countries. Of late years, for instance, an immense trade has arisen in Germany in brown-coal briquettes, which are actively exploited by a syndicate of producers. This is a form of competition with coke which fortunately the English manager has not yet to fear. He will, however, be able indirectly to draw many useful hints from Mr. Körting's remarks. Another good paper was that by Dr. Allner on the use of coal tar as a fuel in engines of the Diesel type. This paper also applies more particularly to German conditions, since the import duties on petroleum in Germany restrict the available supplies of cheap fuel for engines of this type. The paper, however, gives some very generally useful information on the qualities and composition of tar from different types of carbonizing plant. There were, further, two papers of an interesting character on the working for several years past of installations of pressure lighting devices for public lamps in the streets of Bromberg and Königsberg, contributed by the respective gas engineers of those towns.

The work of the Technical Committees of the Association during the year has been of a very valuable character; and the reports, of which a summary will be given in an early number of the "JOURNAL," will be read with interest. The papers relating to water supply which were read at the meeting were of a more fundamental and generally interesting character than usual, and evoked in several instances most lively discussions. It is pleasing to record that in these Sir William Lindley took an active part, and that his high attainments as a water engineer, and his great services to the Association as Chairman of more than one of its Technical Committees, were recognized by his nomination by the Council as an honorary member of the Association. The announcement was received by the meeting with very marked signs of approval and congratulation.

Standard Burner Joint Promotion.

THE time is opportune for again prosecuting vigorously the conversion of the old standard test-burners to the new one, approved by Parliament and the Board of Trade. Last week we referred to the success of the Newcastle-upon-Tyne Gas Company in obtaining—quite inexpensively and promptly—under the power possessed by them in their Act, and through the Board of Trade, the "Metropolitan" No. 2 burner as their standard one; and we then advised all companies who are fortunate enough, in their testing clauses, to have the right to the supersession of their old standard test-burners by the new one, subject to the approval of the Board, to go and do likewise. There are, of course, several hundreds of gas companies in the country who are not fortunate enough to possess the power; and it is a pity, in view of the friendly attitude that Parliament and the Board of Trade have displayed in this matter, and their obvious wish that gas testing should be placed on a uniform footing throughout the country, that other companies who have not the appendix regarding "other approved burner" in their testing clauses should not now make a move collectively to have the "Metropolitan" No. 2 burner substituted for their present instrument. The fight over the Joint Bill of the session of 1910, and the defeat all along the line of the authorities who imagined they had a substantial grievance, which proved to have been but visionary, and has all vanished into thin air, paved the way for something bigger in the nature of a promotion. Those who fought in 1910, just as those who had fought before, were doing so for the whole industry; and to them is due the credit for clearing the paths of those who afterwards might desire to bring themselves into line in the matter of the use of a scientific instrument which correctly defines the illuminating quality of the gas.

Since the success of the Joint Bill of 1910, there have been several companies who have regretted that time was against them in participating in those promotions; and they have asked whether the Gas Companies' Protection Association cannot even now assist them in procuring the conversion of their test-burners to the "Metropolitan" No. 2. The Gas Companies' Protection Association desire to be of as much use as possible in this matter as in others that come

within their province; and therefore Mr. Fred. E. Cooper, the Secretary (5, Victoria Street, S.W.), has been instructed by the Committee to ascertain how many companies are prepared to join if a fresh promotion be undertaken. He is doing this betimes, in order that there may be no subsequent regrets that a narrow time-limit prevented many companies uniting in the promotion. But there should be no delay in signifying a willingness to participate (gas companies who are not members of the Association are quite at liberty to join in it), inasmuch as, if the movement is going to be a large one—and the larger the better and the cheaper—ample time will ensure comfortable sailing throughout. The first thing, however, is to give Mr. Cooper notice of a desire to unite in the promotion; and if the proposal meets with support satisfactory to the Committee of the Association, then a meeting will be convened to further consider the matter, at which all information as to procedure, probable expense, &c., will be given. When Mr. Cooper asks the number of gas companies who are likely to take part in the promotion, we should say "all will do so who have not the right to use the No. 2 "burner at the present time, or who have not in their testing "clause the power to directly ask the Board of Trade for "their approval to the change." There were, we know, a few companies who had some fears, at the time of the 1910 promotion, that the local authorities would secure all sorts of amendments in existing legislation as the result of the new burner being prescribed. But Parliament courteously and firmly told the local authorities who tried to get things to which they were not entitled, that all that was under consideration was the question as to whether or not it was right to apply the new burner; and ever since, those companies who took part in the joint measure, and came out of the conflict in possession of the new test-burner, unaccompanied by any conditions whatsoever, have been the objects of envy by those who then feared. If there are any who fear in the same way now, all they have to do is to read the proceedings on the Joint Bill of 1910, and their fears will be dispelled. We shall hope to see a joint promotion next session that will make the 1910 one look small in comparison, and that will place another red-letter year in the history of the march-forward of the gas industry.

Carbonization Doubts.

THERE is evidence in our columns to-day, as there was last week, that the extraordinary supply of literature on carbonization at the Glasgow meeting of the Institution has revived interest among British gas engineers in the respective merits of the carbonizing methods that are courting favour in the industry. This was to be anticipated, in view of the fact that, in the main, the papers constituted the first record of results and experiences over long periods of working under British conditions. But there is abundant testimony that the papers have not produced any complete satisfaction in the minds of critical carbonizing experts, nor that they have done much in producing any pronounced favour among engineers who have been vacillating between full horizontal, intermittent vertical, or continuous vertical working. It is well to look for the reason or the reasons, and when found to treat them with the seriousness that they demand. There are, it is observed, from the voluntarily contributed communications to our columns, certain clear points that the advocates of the vertical systems have to deal with in the prosecution of their "proselytizing" work; and it will surely be to the interest of all carbonizers if they are deliberately and pointedly handled before possible misconception becomes a widely acknowledged truth.

It is complained that most of the published comparisons of working so far have been between the vertical systems and light charges in horizontal retorts, and not between vertical working and, with the same coals, full or heavy charges in horizontal retorts. Probably one of the best pieces of usefulness in this connection has been furnished by the carbonization of a quantity of Derbyshire coals in the Dessau verticals at Sunderland, at Mr. J. Ferguson Bell's request, for comparison with his heavy-charge working at Derby, as described in his Institution contributions of 1909 and 1910. The results of the vertical trial of the coal appeared in Mr. Dru Drury's Glasgow paper. The comparison can be extended by taking the results of the carbonization of Derbyshire coal in the table headed Glover-West settings at Droylsden, as presented in the "Summary of "Tests" in Mr. J. G. Newbigging's paper. Now Mr. Bell is so far satisfied with the results from the verticals that, though he does not say that they would justify scrapping horizontal retorts in which heavy charges can be used, he is persuaded that the results are of a character that should command attention when considering the question of extensions or reconstruction work.

This brings us to a question which has been made in two separately contributed articles in our columns; and it is the question that is of all debatable matters that have arisen around this subject the most difficult to satisfactorily dispose. It has, however, to be met by our vertical friends; and, to meet it as is desired by the critics, comparison has to be made on the best of all modern lines. The point is as to whether the acknowledged additional capital cost of vertical settings will, through improved make and economies, prove a good investment when contrast is made with modern horizontal retort-settings, using heavy charges, with coal-handling plant and charger and pusher on one side of the bench only, and a coke-conveyor on only the other side of the bench. From the capital point of view, it was a bad thing for vertical retorts that the old order of coal, machine, and coke equipment in a horizontal retort house was found capable of reduction by one-half. However, those are the lines, in respect of capital, on which comparison is desired by many who are looking into the matter. Mr. P. C. Holmes Hunt dealt with it in his contribution; but it is obvious that his argument has not altogether carried conviction, and that something more is required. We are strong believers in not adhering to any old standard of capital expenditure per ton of coal carbonized, or any other unit of comparison, when a departure from it can be shown to be a remunerative investment. Directly this is conclusively done, the old standard has become obsolete. But there it is. Experienced carbonizers among British gas engineers, after exploring all that has been put before them, have their doubts as to the working results and economies of verticals having a value in excess of that of the extra capital cost involved in producing them. These are the prominent matters that have to be further argued by the exponents of carbonization in vertical retorts—both continuous and intermittent. They are of greater importance at the moment than such questions as pressures in the retorts and temperatures of carbonization, which are both amenable to treatment to produce the modification considered desirable.

Sulphate of Ammonia Production.

THE first annual report of Mr. W. S. Curphey in the office of Chief Inspector under the Alkali Works Regulation Act is a successful effort to continue the informative and directive value of these documents on the lines laid down by his eminent predecessor, Mr. R. Forbes Carpenter. If in some respects the report does not contain quite so much enlightening material—resulting from investigations into, for example, the causes of certain effects in connection with carbonization—there is no discredit in the fact to the new Chief Inspector, who has hardly had time to settle down in his new office. Such work, welcomed though it is, is over and above what is required; and it was due to the desire of Mr. Carpenter to make his department and its resources as serviceable as possible that induced him to enter into the byways in search of, and to gather, information that should be of advantage to those he served. And he served through his official capacity both the Local Government Board and the owners of works that came under the surveillance of himself and the District Inspectors. Mr. Curphey has a very difficult man to follow, whose high ideals he has adopted. We know Mr. Curphey; and this first report gives the promise that year by year there will be a growth in value, as in the case of the reports of his predecessor.

The work of the Chief Inspector's Department grows—not only in the number of works that have to be inspected, with their extended production, but in the matter of keeping a watchful eye on all new processes that are applied in the works. In the past twelve months, the number of works increased from 1857 to 1872. Looking down the constituent items, it is observed that sulphate and muriate of ammonia works have increased from 536 to 543, gas-liquor works from 55 to 57, and tar-works from 151 to 154. These three classes of works represent together 754, which is more than one-third of the total under inspection. The most interesting side of the report for gas men is found in what Mr. Curphey has to say on the subject of the production of sulphate of ammonia; for the gas industry representing the largest single producers of sulphate of ammonia in the

country is compelled to keep an eye on what is being done in other quarters. It was only in 1908 that the gas industry could claim to produce upwards of 5000 tons of sulphate of ammonia more than all the other sources combined. But 1909 saw the other sources collectively had exceeded the gas undertakings in production by more than 20,000 tons; while this year, although the make of the gas undertakings is at its record figure of 167,820 tons, the aggregate production of other sources is 32,000 tons in excess of that of the gas undertakings.

Interest is also found in examining the figures in another way. The recovery of sulphate of ammonia in 1910 totalled 367,587 tons, which is 18,444 tons more than the year before. Gas undertakings increased their production by 3544 tons; but iron-works had the small decrease of 89 tons. Shale works yielded about 2000 tons more; while coke-oven works piled 9779 tons on to their previous accumulation of 82,886 tons. This, however, is only little more than half the increase (18,659 tons) experienced in 1909 in comparison with 1908. This reduction in the rate of increase is ascribed by the Chief Inspector to the prolonged strikes, which curtailed the operations of the coke-works. Anyway, the prolonged strikes did not prevent the coke-oven works swelling their total output by nearly three times more than the gas-works were able to do. However, Mr. Curphey bids sulphate of ammonia producers (as do other investigators of, and reporters on, the subject) to be of good cheer, for with all the extended production, and the competition brought about by the fixation in serviceable form of the nitrogen of the atmosphere, Mother Earth requires it all, and the growing population needs the increase in produce.

The enlarged interest that has been shown in the process of ammonia absorption by dilute sulphuric acid both at coke-oven works and in connection with small plants for gas-works is referred to by Mr. Curphey. The subject is now of quite respectable age; but the extending application of the system keeps interest in it green at the present time. The system has its advantages. The avoidance of noisome effluvia is one; and the ease with which the sulphuretted hydrogen is dealt with is another. Beyond this, there is the escape from all loss of ammonia due to storage and transmission of ammoniacal liquor. When stored in ventilated tanks, there is bound to be loss to the atmosphere, varying with the degree of exposure, the strength of liquor, duration of storage, and other factors. Mr. John T. Sheard has estimated that, in twenty-four hours, with a still atmosphere, the loss may amount to as much as 3 to 5 per cent. of the whole amount exposed. But while there are advantages, attributable to the absorption of the ammonia by sulphuric acid, there is the disadvantage of a lower yield of sulphate of ammonia per ton of coal carbonized. Whether it is a good system to adopt depends primarily on circumstances—in the case of the Mond and coke-oven systems, the application of the method has been brought about mainly by the large volumes of gas that have to be dealt with. This is not the reason, however, that has led to its adoption in small gas undertakings. But that is a matter on which some information was given at the meeting of the Southern Association last November.

Profit-Sharing by Municipal Gas Workers.

THE question of the development for municipal gas workers of a profit-sharing scheme having close affinity with the successful co-partnership system founded, developed, and made as firm as a rock by the late Sir George Livesey has often been touched upon in debate; but everybody who has so far given the matter really serious consideration has relinquished it with the feeling of the impossible hanging over it. The nearest approach to co-partnership of anything that has been done in the way of offering reward to municipal gas workers over and above their wage is the scheme at Stafford, whereby the gas workers divide as reward for well-doing a part of all savings effected on a fixed standard rate of manufacturing costs. A contributor to our columns this week makes the best attempt that we have yet seen at framing a scheme for municipal gas workers—that is to say, a scheme that has as close an approximation to gas co-partnership as it seems possible to make it, having in view the differences of circumstances. Without accepting it as perfect, we congratulate him upon the ingenuity of the proposal.

This is, however, a matter that requires to be examined carefully by those in close touch with the circumstances under which it is contemplated to apply such a scheme. We therefore invite those interested in the management of municipal gas undertakings to express their views in the most critical or commendatory manner that pleases them, and that gives expression to their opinions. We know our contributor will not hesitate to discuss in our columns all the matters placed before him in their various bearings. Further, it is recognized that, in the interests of freedom of discussion, anyone participating should be quite at liberty to use a *nom de plume*, as, in a matter of this kind, which is distinctly one of policy, the personal view of an engineer or secretary of a gas department might not accord with the opinions of his committee.

There are two or three weaknesses that, on first blush, we see in the scheme, in comparison with co-partnership as practised by companies. The first is the Workmen's Investment Society. The fact that the whole of the investments, care of money, &c., in connection with co-partnership in the case of a gas company are undertaken by the company, gives a sense of security and stability to the men. It is questionable whether the Workmen's Investment Society would afford the same feeling of security and stability. Then, again, the investment in municipal funds would not encourage the same feeling of direct personal part and lot in the gas undertaking as, under company co-partnership, investment in shares or stock. A further drawback is that the interest on municipal loans is not so high per cent. as the dividend on gas shares or stock. However, our contributor has done the best he can under the circumstances; and the scheme is open for consideration. We hope it will receive full and careful discussion, as we feel its importance. There may come a time when the municipal gas worker will begin to compare his position with that of the co-partner gas worker engaged with a gas company.

Further Signs of Alarm.

The alarm that the success of high-pressure gas lighting has created in the camps of those who believe—or rather who say they believe, which is quite another thing—the gas industry is in a moribund condition, had fresh exemplification at the meeting of the Incorporated Municipal Electrical Association last week. That dear old soul the "Electrical Review" thinks the gas industry is fighting in the last ditch; and the "Electrician" comes out with crude poetical effusions about gas, for the delectation of those of its readers who are soft-pated, and who are readily delighted with any absurdity about the recession of gas and the triumphant progress of the perfect electric light. While this sort of foolishness is going on in our electrical contemporaries, Electricity Committees are gravely considering how they can stop the easy march of high-pressure gas-lamps in superseding electric lamps. But they find this is not very easy to accomplish. The matter has also been discussed at the meeting of the Municipal Electrical Association; and fresh testimony has been given to the repeated shocks that high-pressure gas is giving to electricity purveyors. The discussion on the matter was opened by Mr. A. H. Seabrook; and that spirited individual is for doing anything—we believe he would give energy away to stop gas scoring a success—to prevent any further triumphs of the enemy in this way. But there are others who look at the matter in a commercial light, and who fail to see where the ultimate advantage is coming in of doing business without any profit, even to spite the gas industry. There are also those who seem to entertain hope that, under the circumstances, some mutual understanding may be effected with the gas industry. The suggestion was actually made at the meeting. It is rather interesting. And besides interest, there is something humorous about it. It at any rate shows that there are men in the electrical industry who are descending from those lofty heights from which they thought at one time they could see in the distance the ultimate extinction of the gas industry. But Mr. Seabrook does not like this "sloppy" sentimentality on the part of electricians; for he does not like the gas people any nearer to him than he can possibly help, and thinks the proper place for them is at arm's length. That is a compliment to the gas people. Likewise, we are much in sympathy with Mr. Seabrook's views; for we do not see what the electricity industry has to offer to convince the gas industry that there would be advantage to it in a mutual working understanding. However, it is a matter of more than ordinary interest that such a proposal has emanated from the electricity industry. If that industry was marching along so

victoriously as its press would try to make people believe, does anyone think that a proposal as to a mutual understanding would have been made?

Municipal Gas-Works Results.

The report which Mr. Charles Wood, the Gas Engineer and Manager to the Bradford Corporation, submitted to the Gas Committee on Friday last, and noticed in another part of the "JOURNAL," shows results for the past financial year of which, he says, everyone connected with the Gas Department has reason to be proud, inasmuch as the trading in the twelve months showed a net improvement to the extent of £13,672 over the previous year. The net profit was £12,934, compared with a loss of £737 in the year 1909-10; the former figure being more than double that shown in any previous financial period since the price of gas was reduced to the present figure seven years ago. Mr. Wood points out that the satisfactory results he is able to present have been obtained in the face of increased expenditure for wages, rates and taxes, and nearly every class of material used, and in spite of the still heavy burden caused by the purchase of several gas undertakings since 1900. The payment of interest and sinking-fund charges on the goodwill alone of these undertakings cost £18,000 last year; and the gas consumers in the added districts benefited to the extent of no less than £13,166. Beyond this, certain repairs and renewals, &c., were charged entirely to revenue. Mr. Wood says, "in comparing the returns with those of others, it is important that these facts should not be overlooked." The only unsatisfactory feature of the year's working was the small rate of increase in the quantity of gas sold in the central area of the city, which is stated to have been due to the extended employment of electricity, and to the more economical methods of using gas; and Mr. Wood says it only proves the necessity of "utilizing every reasonable opportunity of advertising the many advantages of gas, and extending its use." During the year, a good deal more was spent in this way than had previously been the case; and Mr. Wood expresses the confident opinion that the Committee will reap the benefit of it by increased business.

There was, we learn, a considerable general improvement in working results at Cockermouth, compared with the preceding twelve months. The gross profit was £1269, against £1237; and there was a net profit of £274. It has been found here, as at other places, that there has been a large increase of business arising out of the policy adopted last year of holding an exhibition, and advertising cookers and fires in the local papers. A reduction was agreed upon of 3d. per 1000 cubic feet in the price charged to ordinary consumers; and at the same time a concession was made to the users of prepayment meters. The accounts of the Edinburgh and Leith Corporations' Gas Commissioners for the year ended May 15, show, as already announced, that (subject to audit) the gross profit on the year's working amounts to £115,874, or £9486 less than for the year 1909-10. This is accounted for by the reductions made in the price of gas. The quantity of gas sold shows a diminution of 2·39 per cent., but an increase of 1·78 per cent. on the sale for 1908-9. After deducting from the gross profit the annuities for the year, mortgage interest and expenses, and the contributions to the sinking and reserve funds, a surplus profit of £5748 remains. The demand for gas at Haverhill has gone up, and the price has gone down; the result being that, in spite of the fact that the charge for gas was reduced to the extent of 2½d. per 1000 cubic feet, the receipts have been very nearly as large as in the preceding year.

The gratifying announcement comes from Hereford that an increase in the sales of gas amounting to 7½ million cubic feet has been provided without the carbonization of any additional quantity of coal; the explanation being that the make of gas has gone up from 11,540 to 12,054 cubic feet per ton. Again, there was a record in the amount of gas sold per ton of coal carbonized—11,278 cubic feet; the unaccounted-for gas being reduced from 5·9 to 4·8 per cent. There is a gross profit of £3934. It is pointed out that the Committee are in an almost unique position in having up-to-date works and plant, including 35 miles of mains, and capable of supplying 180 million cubic feet of gas a year, with an outstanding capital of only £26,000, including £11,500 invested in slot installations. They have always paid for new meters, cooking-stoves, and gas-fires out of revenue; and now the capital account has been closed entirely. In spite of a reduction over the whole year of 1d. per 1000 cubic feet, sales of gas at Hinckley produced £605 more than in the preceding twelve months. The net balance is £3528, against £2977. There was at Ossett an increase of about 5½ million cubic feet in the quantity of gas sold. The yield of gas was 11,160 cubic feet per ton, compared with 10,978 feet per ton in the previous year. A gross profit of £8265 is shown. Records have been scored in every direction—in make, in sale, in the number of customers, in the low percentage of leakage, and in profit; and the Town Council are justly gratified with this position of affairs. A good residuals market and increased sales of gas have resulted in a gross profit on the year's trading at Stourbridge of £11,977. The increase in the sales of gas was close upon 6 million cubic feet. The make was at the rate of 11,025 cubic feet per ton of coal carbonized. The report and accounts from Wigan (notice of which in the news columns is unavoidably held over until next week) show that, as compared with the previous year, there was a decrease in the consumption of gas for all purposes of about 3¾ millions, or 0·85 per cent. The number of gas-cookers fixed exhibits some falling off; and there was a decrease in the consumption of gas during the year under this head of some 4¾ million cubic feet, or 11·57 per cent. This abnormal slump in the use of gas for cooking purposes is confidently stated to be due to the general condition of trade being so bad, and not to any lessening of the popularity of the use of gas for this purpose. It is noticed that the make of gas per ton of coal and cannel carbonized was 11,677 cubic feet, compared with 11,625 feet in the previous year. The total net profit for the year is £10,086, as against £10,299. This sum includes £5521, the value of gas which has been supplied free for public lighting within the borough.

The Position of Nitrate of Soda.

The past half year has seemingly been an interesting one to those connected with the nitrate of soda industry. At the close of 1910, it is pointed out by Messrs. W. Montgomery and Co. in their half-yearly report, it was found, when summing up the statistical position, that the world's consumption for twelve months showed an increase of 302,000 tons over that of 1909, which, in its turn, exhibited an expansion over 1908 of 196,000 tons. That is to say, there was a growth of consumption in the two years of 500,000 tons. Now we learn that during the six months just ended there has been a further increase of 90,000 tons, or 5·7 per cent. Of this quantity, Germany absorbed 548,000 tons, or an increase of 3 per cent.; Belgium, 237,500 tons, or an increase of 7 per cent.; and France, 290,000 tons, or an increase of 3·6 per cent. Expansion is also recorded in the cases of Holland, Italy, and Austria. As far as the United Kingdom is concerned, the consumption—86,000 tons, against 77,000 tons—is regarded as very satisfactory, showing as it does an increase of 11·7 per cent America, with 328,000 tons, exhibits an increase of 14 per cent. But these figures, the report adds, hardly do complete justice to the continued expansion of the demand for agricultural purposes, inasmuch as it is stated that for explosives and chemical uses there has of late been a falling off to the extent of from 20 to 30 per cent., which, however, it is presumed, will only be of a temporary nature. "It is," the firm assert, "from this comparatively new field for agriculture that considerable expansion may be confidently looked for from now onward." The world's consumption of nitrate of soda for the twelve months ending June is given as 2,331,000 tons, against 2,242,000 tons for the previous year, which shows an increase of 89,000 tons, or 4 per cent. Europe absorbed 3 per cent. more than in the corresponding period, and the United Kingdom 9·3 per cent. more; the increase in the case of the United States being 4 per cent., and in that of other countries 9 per cent. Stocks in Europe, at 87,000 tons, are, it is said, for so extensive an industry, decidedly small, and compare with 141,000 tons in 1910. The quantity afloat (estimating June shipments at 110,000 tons) is 259,000 tons, against 268,000 tons, so that the visible supply for Europe to-day stands at 346,000 tons, as compared with 409,000 tons twelve months ago. The course of prices during the past six months has varied for the most part to the extent of 4½d. per cwt., though one or two exceptional cases would make the difference between highest and lowest about 6d. Early in January, the value of arrived cargoes was 8s. 8d. to 8s. 9d. per cwt., cost and freight; while now due cargoes are quoted at 8s. 10d. to 8s. 11d. per cwt., without sellers, and cargoes of refined quality are held for 9s. 1d. per cwt.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 66.)

BUSINESS on the Stock Exchange was quiet enough last week; for the City was in festive mood, and on Thursday gave itself up with enthusiasm to offering another loyal welcome to its King. But inside the House depression reigned. Markets were gloomy and weak; and the choicest lines were the weakest. No one seems to understand exactly why this should be; but so it is. With cheap money and other favourable factors, Consols nevertheless keep on shrinking; and last Saturday they were marked several times at 79. Railways, of course, were oppressed by the strike. The opening day was perhaps the best of the week. The gilt-edged group were firmer, and Consols rose $\frac{1}{8}$. Americans advanced strongly, but were inclined to realize at the close. Tuesday was quiet. Consols shaped well at first, but gave way later on. Fear of the strike area extending hit Railways. Americans were very fair. Wednesday was less depressed; but Government issues were barely steady. Rails tried to be cheerful, but gave up at last; and Americans were lower. Thursday was, of course, very quiet. The tone was poor, especially in gilt-edged, and Consols fell. Rails rallied a bit upon a few buyers being tempted by the low prices. On Friday, the settlement was concluded—not without rumours of difficulties. The general tone was quite weak. Consols and other of the gilt-edged class were lower. Railways were discouraged by the failure of strike pacifiers. On Saturday there was no amendment, and the tendency was flat all round. Consols showed a loss of $\frac{5}{8}$ on the week. The Money Market was firm in face of a strong demand for the Stock Exchange and the close of the half year. Discount rates ruled lighter. Business in the Gas Market was about a fair average in point of volume, and the tone was unchanged. Changes in quotations were mostly the result of *ex div.* adjustments. In Gaslight and Coke, the ordinary was well supported and prices advanced, ranging from 106$\frac{1}{8}$ to 107$\frac{1}{4}$—a rise of $\frac{1}{4}$. In the secured issues, the maximum realized 86$\frac{1}{4}$, the preference 104 and 104$\frac{1}{4}$, and the debenture 78$\frac{3}{8}$ and 78$\frac{3}{4}$. South Metropolitan was rather more active, and was done at from 119 to 120$\frac{5}{8}$. The only mark in Commercials was one bargain in the 3$\frac{1}{2}$ per cent. at 109$\frac{1}{4}$. Among the Suburban and Provincial group, Alliance and Dublin changed hands at 83$\frac{3}{4}$ (a fall of 1), Bournemouth preference at 14$\frac{11}{16}$, Brentford old at 260, ditto new at 204, Ilford "A" at 120 (a rise of 1), and, on the local Exchange, Liverpool "A" at 215 and 216. In the Continental companies, Imperial receded another point, with transactions ranging from 184$\frac{1}{2}$ to 186, European was done at from 19$\frac{15}{16}$ to 19$\frac{1}{2}$, and Tuscan at 9$\frac{1}{16}$. Among the undertakings of the remoter world, Bombay was marked at 6$\frac{3}{8}$, Cape Town at 2$\frac{1}{4}$ (a fall of $\frac{1}{2}$), ditto preference at 5 (though the quotation was left standing at 6-6$\frac{1}{2}$), Monte Video at 12$\frac{7}{8}$ and 13$\frac{1}{8}$, Primitiva at 7$\frac{7}{16}$ and 7$\frac{1}{2}$, ditto preference at 5$\frac{3}{8}$ and 5$\frac{1}{2}$, ditto debenture at from 97$\frac{1}{4}$ to 98$\frac{1}{2}$, and San Paulo at from 19$\frac{5}{8}$ to 20$\frac{1}{4}$—a rise of $\frac{1}{2}$.

ELECTRICITY SUPPLY MEMORANDA.

At Brighton—"The Times" on Current Municipal Topics—Seabrook on "Other Uses"—Admirable Optimism and Tactics—How to Deal with Grumbling Consumers.

THOSE members of the Incorporated Municipal Electrical Association who travelled to Brighton, *vid* London, last week for their annual conference patronized high-pressure gas-lighted railway termini; and if they were at any one of these stations at night time, it is hoped they were duly impressed with the excellence of illumination. In competition with the system, they have been duly impressed with its economical character, its reliability, and its freedom from the bad flickering habit of certain competitors. Unquestionably central station engineers do not desire to see gas make such another flight in economy and efficiency as was done when a single jump was made in efficiency from between 30 and 40 candles per cubic foot of gas to between 60 and 70 candles, according to the quality of the gas. However, out of respect for their President (Mr. John Christie), we do not suppose the members said much about the lighting of the Brighton Railway Station; and it would have been a little out of order to criticize it, seeing that, among the visits the organization were paying during the week, was one to the Brighton and Hove Gas Company's Portslade works—the Company who have shown at the railway station that, on commercial lines, gas lighting does not take second place to electric lighting.

Such parts of the proceedings at the meeting as may be deemed to be of interest will be noticed in the "Memoranda" in future issues of the "JOURNAL." Meantime, there is interest in an article in the "Engineering Supplement" of "The Times," which supplement has always a strong inclination away from gas and towards electricity. This particular article heralded the meeting, by summing up a few of the more important questions in which the Association are currently concerned. It is the view of the writer of the article in question that "we are now on the eve of *expected* great developments in electrical cooking and heating." No matter how this statement is looked at, there is an outstanding caution about it. The word "expected" appears to have been some afterthought, and to have been thrust into an already constructed sentence in order to safeguard the writer. Of course, great developments have been "expected" in cooking and heating for many long years; but electricians cannot get over the fact that some great injustice was done electricity in the dispensation of gifts originally, by investing a full-blown unit with only a thermal value of 3420 B.Th.U. or thereabouts, while a paltry cubic foot of gas can boast of from 500 to 600 B.Th.U., and 6 cubic feet of as many as 1 unit of electricity.

Another question that is well in the minds of municipal electrical engineers is that of profit appropriation in relief of the rates. There is a solid body of municipal gas engineers who are on the side of the municipal electrical engineers in inveighing against the bad policy of relieving the rates from the profits of local trading departments. It is indeed a "vicious policy." But it exists; and, where it does so, it ought surely to be applied on terms of equality, and the businesses, too, ought to be administered on the same lines. It is unfair of the writer of the article to suggest any alliance between the gas interests and the Local Government Board, in the matter of the regulation of the loans for municipal electricity supply. The development of a more rigorous inquiry into, and control of, municipal electric supply loans was brought about entirely by extravagance, by maladministration, by misapplication of loans, by over-spending, by running concerns at a loss, and by local authorities setting at nought the power of control vested in the Local Government Board. For anything that has happened in the matter of stricter control, and over which there now exists grievance, the municipal authorities have only themselves to blame. The question of wiring and hiring is also touched upon in the article; and it seems, as we long since surmised was the case, that the truth has penetrated home that the cost of promoting a joint Bill to secure the powers would be very great, in view of the opposition of electrical contractors, ironmongers, plumbers, and large ratepayers. Yet many local authorities are unwilling to confer anything more substantial than their blessing on the promotion. In consequence, there is very little chance of the measure being introduced for the wide purposes originally proposed. If a Bill is promoted, it will probably be on the lines of hiring powers only, without embracing wiring.

Mr. A. H. Seabrook, formerly of West Ham and now of Marylebone fame, has been discoursing in the "Electrician" on encouraging the use of electricity for domestic purposes other than lighting. The first thing that is necessary is a proper system of tariffs; and the only system which is effective for encouraging uses other than lighting is, in Mr. Seabrook's opinion, one which allows such uses by connecting up to the lighting wiring. Therefore, the tariff must be one which is constituted of a standard fixed charge, with a low rate (generally 1d.) per unit afterwards—that is to say, all standing charges are to be thrown on to the lighting installation, in order that "other uses" may obtain electricity at a low price per unit. But Mr. Seabrook writes: "I consider it to be perfectly justifiable to *insist* upon a complete installation of electric light in a house before a consumer can have current for other uses at the secondary charge only." Whether this is permissible, it appears to us, depends upon the statutory authority under which an undertaking may be working. In the first place, an electricity undertaking cannot refuse to supply a consumer who complies with the statutory conditions; and no powers whatever are conferred upon an undertaking to dictate to a consumer the manner in which he is to use the current he purchases. Then, "the undertakers shall not, when making any agreement for the supply of electricity, show any undue preference to any local authority, company, or person; but, *save as aforesaid*, they may make such charges for the supply of electricity as may be agreed upon." Now Mr. Seabrook confesses that the whole of the heavy standing charges are thrown on the lighting part of the installation; and there is no obligation upon the lighting consumer to use electricity for other purposes. But if he does use electricity for other purposes, he obtains it at 1d. per unit; there being, on Mr. Seabrook's own written confession, no standing charges attached to any consumption but for lighting. The consumer therefore obtains electricity for other purposes at 1d. per unit, because he is a lighting consumer; and therefore he obtains a preference. It is a moot question whether Mr. Seabrook is not showing an undue preference if he declines to let another person have current for other purposes than lighting at 1d. per unit. He also shows that he uses this differential charge for purposes other than lighting, to attempt to drive customers to give up their liberty (which Parliament confers upon householders by compelling both gas and electricity suppliers to furnish upon request a supply within a certain distance of the mains) in lighting matters, and to compel them to forsake gas, and use electric light only. For with all the boasted virtues of electricity, Mr. Seabrook confesses that consumers with experience of both systems "generally" use gas in the long-hour part of their houses, and electricity where it is little required. That is more eloquent testimony to gas than we have ever heard from Mr. Seabrook. These are his words, and they describe his method of procedure:

> The method of application is as follows: Suppose a consumer wants to put in "other apparatus," and we find he only partially uses electric light, and uses (*as is generally the case*) gas in the long-hour part of his house—*i.e.*, the basement—we say our charge for "other uses" is 2d. and 1d. on the maximum demand system; but "if you will *wire your house throughout* and enter into a contract on our 'telephone' system, you can have all units at 1d."

Mr. Seabrook writes himself down as a veritable commercial tyrant.

There is only one criticism that we have to make of the circular-letter sent out to consumers adopting the "telephone" tariff system; and it is found in the clause of the letter which says: "Cooking and heating only cost 1d. per unit, at which price *electricity is as cheap as gas for these purposes*." The experience of householders who have tried both systems does not confirm the italicized words. Then Mr. Seabrook dilates on the importance of a pushing business-getting staff to keep in touch with consumers; and there is striking recognition in this connection of the proneness of electrical appliances to get out of repair, as "frequent reminders" are sent to consumers to keep their apparatus in proper order. The first words of the reminder are: "Consumers are earnestly requested to let us know if any of their electrical apparatus—such as fans, radiators, irons, ovens, kettles, &c.—are not in working order. Frequently the faults are such that we can put the apparatus in order free of charge, and where this is impossible we will quote a low price for the repair." Among other means of encouraging business is to loan appliances (we take it these are new) for a short period; and there is assurance that the resulting sales have been most gratifying. A few words are said as to the value resulting from effectively arranged show-rooms.

Then there is light upon a little ruse of Mr. Seabrook's for capturing custom. He likes to be in a position to "offer" hiring terms; but there is a preference for the hiring terms to end at the offer. The offer of the hiring terms is but the pathway for an attempt to induce the consumer to go on to hire-purchase. Mr. Seabrook is very frank in giving electrical appliances all possible certification as to the shortness of their careers. He says the "hire of apparatus is no good as a business deal, unless a very high rental can be obtained." On small apparatus it should be 50 per cent. per annum on capital value. Phew! Words speak loudly here. Then in connection with hire-purchase, there is a manifest desire to get possession of the cost of the articles as quickly as possible, inasmuch as he thinks the best basis is to handle 25 per cent. of the total price of the work in advance and before the work is commenced, and then for the balance to be paid off in eight quarterly instalments. Maintenance work is another desirable thing. It is found that Mr. Seabrook looks to cookers and radiators for the future big electricity business for domestic purposes; and, in emphasizing his hopefulness, he treads on the dangerous ground of "poisonous fumes." However, we will reproduce his optimistic words in this regard without further comment:

> Cookers will also be more generally used than radiators, because the cost is as low as gas at 1d. a unit; and the enormous hygienic advantages which electricity possesses over gas, in addition to the absence of poisonous fumes, heat, and general nuisance, ensure that the future of electric cooking will be exceedingly great. Needless to say, none but the wealthy will buy electric-cookers outright, any more than people will buy gas-cookers; and we have got to make up our minds to adopt the same tactics as our gas competitors—in fact, as we know their struggles and difficulties in introducing gas-cooking some years ago, we can start out on a more favourable basis.

At the same time, "an electric cooker must do all that a gas-cooker will, and more quickly." What a pity the B.Th.U's. of a unit of electricity cannot be multiplied many times!

There have been some interesting remarks in the "Electrical Times" on the subject of "Meteorology and Lighting Bills." The managers of electrical undertakings, as gas suppliers know from the communications of consumers who revert to gas, experience complaints of the amount of the accounts from their patrons; but we have never yet heard of a gas undertaking that has suffered to such an extent in this way that it has been found necessary to have printed explanations and excuses ready for the grumbling consumers. Mr. W. G. Pickvance, of Wrexham, is a central station engineer who has adopted this course, in order to pacify consumers who will make comparison with the corresponding quarter of the previous year. This is inconvenient to the central station engineer, not only on account of differences in the meteorological conditions, but owing to the fact that the consumers themselves soon lose that happy electrical virtue of having only the necessary lights switched on in the rooms that are being used and the remainder of the house in darkness. But when complaints are made, this lapse from the path of electrical necessity is not referred to; but the meteorological conditions of the quarter are blamed. Mr. Pickvance states that he had an "extraordinary number" of consumers whose accounts for the December quarter of 1910 were "considerably" larger than in the same quarter of 1909; and he and members of his outside staff were subjected to the annoyance (it could hardly have been a pleasure) of personal complaints in the streets. So he prepared a few short explanatory notes, pointing out how dull the December quarter of 1910 was in comparison with that of 1909, and had them neatly printed on a card. When accosted in the streets, and the complaint commenced, Mr. Pickvance or his assistants whipped out one of the explanatory cards, and faced the grumbler with it. The card was as effective in stopping a torrent of words, as an electric shock is in producing a yell. Electricity, so runs the fantastic legend of electrical origin, is cheaper than gas. Still electricity consumers grumble to such a degree that printed answers are found necessary to cope with the complaints. It is something of which gas undertakings can boast, that the majority of their consumers are contented with the low price they pay for the large services rendered in lighting, cooking, and heating, and without the telephone system of charging.

RETIREMENT OF MR. WALTER W. HUTCHINSON.

We regret to learn that, owing to ill-health, Mr. Walter W. Hutchinson has relinquished the position of Engineer, Manager, and Secretary of the Barnsley Gas Company, which he has held for the past seventeen years—having succeeded his late father, Mr. John Hutchinson, who was for forty-one years the Company's Secretary and Manager. It is rather more than half-a-century since Mr. Walter Hutchinson entered the service of the Company. Almost from the first, he displayed so keen an insight into all matters pertaining to the manufacture of gas that his future was assured. By dint of close and constant study, he passed from one stage to the other, until at length the Directors conferred upon him the position of assistant to his father, whom, as stated above, he eventually succeeded. During his tenure of the more responsible position, the Company's plant has been greatly increased. Mr. Hutchinson, it may be remembered, was for many years Hon. Secretary of the Manchester District Institution of Gas Engineers, of which he was President in 1890. He joined the British Association of Gas Managers in 1867, and passed successively into the Gas Institute and the present Institution.

Referring to the above-mentioned event, the "Barnsley Independent" last Saturday said: "Owing to continued ill-health, Mr. Walter W. Hutchinson retires from the position he has held so long and so faithfully as Engineer, Manager, and Secretary of the Barnsley Gas Company. This announcement will be received with regret—and especially that ill-health is responsible—by his many friends and the public in general, for Mr. Hutchinson's connection with the town, and with the Company he has served so assiduously, has earned for him the esteem and respect of everyone with whom he has come in contact. The name of Hutchinson is an honoured and familiar one in Barnsley; and the lengthy association of the family with the gas undertaking is very well known."

PERSONAL.

Mr. G. H. Rice, Assistant-Manager at the Truro Gas-Works, has just been appointed to a similar position at the Paignton Gas-Works.

Mr. J. W. M'Lusky, whose elder brother is Engineer of the Perth Gas-Works, and who has been foreman at the Bridgwater (Somerset) Gas-Works for the past four years, has been appointed Manager of the Portrush Gas-Works.

After seventeen years' service with the Tonbridge Water-Works Company, in the capacity of Engineer, Secretary, and Manager, Mr. James Lees has retired; and in the report presented by the Directors at the recent annual meeting, they said they felt sure the shareholders would join with them in expressing their appreciation of the energy he had always displayed during his administration of the affairs of the Company.

Consequent upon the relinquishment by Mr. Walter W. Hutchinson of the position of Engineer, Manager, and Secretary of the Barnsley Gas Company, to which some reference is made above, the Directors have appointed his eldest son, Mr. Harold Hutchinson, who for the past eleven years has been his Assistant, Engineer and Manager. The secretaryship has been conferred upon Mr. T. W. Roystone, who has hitherto filled the position of Chief Clerk.

The employees at the Gas Street works of the Bolton Corporation assembled on Friday to testify their personal respect and esteem for the Superintendent, Mr. A. E. Saville, who, as already announced in the "Journal," is relinquishing the position on his appointment as Engineer, Manager, and Secretary of the Farnham Gas Company. The testimonial consisted of a beautiful silver rose-bowl and an umbrella. Alderman Webster, the Chairman of the Gas Committee, presided, and, after wishing Mr. Saville happiness in his new home, asked the Gas Engineer (Mr. W. J. Smith) to make the presentation. In complying with the request, Mr. Smith expressed his pleasure in doing so on behalf of the officials and the workmen. He said the gifts must be regarded less for their money value than as tokens of the respect in which Mr. Saville had been held during the nine years he had been at Bolton. It was a kind thought which prompted the men to contribute to the testimonial, and he hoped Mr. Saville would appreciate the sentiment. In acknowledging the presentation, Mr. Saville said the gifts would always remind him of the happy times he had had at Bolton. He thanked the donors sincerely, and wished them all much happiness in the future.

OBITUARY.

Colonel Porter, the Chairman of the Liverpool Corporation Water Committee, at last week's meeting, referred to the great loss the Committee had sustained through the death of Professor Sir Rubert Boyce. Sir Rubert, he said, was a man of extraordinary scientific ability and knowledge; and his repute was not by any means confined to the city in which his work principally lay. His connection with the city commenced in 1897, when he was appointed to make bacteriological examinations of the Liverpool water supply. Prior to this, the Committee had only chemical

analyses of the water, and it was felt that, owing to the increasing importance of the science of bacteriology, an expert of acknowledged authority should be appointed to report upon the number and kind of bacteria present in the water supply from the different sources, and in the water as delivered to Liverpool. Since 1900, daily examinations of the water had been continued; and Professor Boyce had also made other valuable investigations into the purity of the water supplied to the city. He was sure they all greatly mourned his loss; and he proposed that a vote of condolence be sent from the Committee to members of his family. This was agreed to.

PROFIT-SHARING AND MUNICIPALITIES.

[COMMUNICATED.]

PROFIT-SHARING was started at Sir George Livesey's instigation in the South Metropolitan Gas Company in 1889—21 years ago. Four years later, the South Suburban Company followed suit. Although the system worked so well in these two cases that it has since been amplified and extended, yet no other gas company adopted it for seven years, when three more started at intervals. However, within the last three years 28 more companies have put into practice various schemes of profit-sharing; and most of these have gone further, and either encouraged or required their profit-sharing employees to become shareholders, and thus in some sense "co-partners," until at present more than one-half the capital of non-municipal gas undertakings is in profit-sharing companies. The total capital of these companies is over £47,000,000. About 19,600 employees share profits between them, which last year amounted to nearly £89,000. Altogether, the employees have received £686,000 in profits above their wages; and they hold nearly £600,000 of stock. The precise figures are given in a table in the annual report of the Labour Co-Partnership Association.* One municipality has inaugurated a system of profit-sharing; and there are not wanting signs that others have the matter under consideration.

It is the impossibility of gauging the value of a man's work before it is done which is one of the fundamental reasons for the claim that workers should share profits. Without this, there are no material reasons why the individual worker should do more than the minimum required to escape dismissal; though clearly there are as many moral reasons why the worker should give the utmost he is capable of, as that the employer should increase the reward if he finds that he is receiving more than his due in return for the wages he pays. True, the worker has the chance of rising to a superior position, though in general this is small, and after the attainment of a certain age almost negligible. But we are not concerned with the opportunity of one man rising among his fellows, but of all rising together; and how else is this to be attained unless a general improvement of capability is to be followed automatically by a rise in reward? By means of co-partnership, this automatic correspondence between the efficiency of labour and its reward can be ensured, along with friendly relations between Labour and Capital. It may be urged that in higher branches of work, and in the professions, the reward is fixed before the work is done. The answer to this is twofold. First, in many cases, as among lawyers, and men of business and finance, this is not the case, but reward follows very closely upon efficiency; and in many other cases, where pecuniary reward seems to be determined previous to the work being done, there is very clearly the reward of promotion and increased pay awaiting success, or in others the rewards of fame and honour—these two latter very frequently bringing pecuniary reward with them. But in other professions, as in the ministry of religion and in the teaching profession, where actual pecuniary reward and promotion are comparatively infrequent, there is great reward due to reaping where one has sown, as well as much variety of work and great human interest—three characteristics which machinery and specialization are driving out of the ordinary workman's life. The workman ceases to be a craftsman, or in any sense an artist; and his work tends to a dead-level of monotony. Yet, it is proved beyond shadow of doubt that there is still great saving to be obtained by efficiency. What incentive can be applied so as to ensure the acquirement of this efficiency among workers? Surely, it must be to bring him to the level of his employer, who devotes himself to the work because he will thereby reap enhanced reward.

In the gas company schemes, a portion of the profits is paid to the workers as a dividend on wages—that is, each man receives of the total profits allotted to labour a share calculated in proportion to his year's wages. When such schemes were first put into practice, it was usual to pay this dividend to the worker in cash; but this was found to do very little good, as the sum each man received was necessarily small, and was often spent without the workman being consciously the better off. It was with this feeling, engendered by their five years' experience, that, in 1894, the South Metropolitan Gas Company increased the rate of their bonus, provided that at least one-half was invested in the Company's stock. This has led to the employees owning shares to the value of over £400,000, out of a total profit received of, roughly, £506,000.

It is this capital-owning which is considered to have been the cause of the improvements noticed among the employees, who feel that the business in which they are employed is in part at least their own; and therefore their interest is kindled in its conduct and success. Sir George Livesey assured the shareholders that all this profit paid to Labour had not decreased in the least the profits assigned to Capital. It was gained, he declared, from the quickened care and zeal of the workers themselves. He laid especial stress on the great opportunities which workers have of saving material and time. Besides this, capital-owning raises the worker in his own esteem; and this in itself tends to make him a better and more capable worker. Again, his interest in this business is still further increased.

But capital-owning has also another great effect. One of the most crushing burdens which many workers have had to face is the fear of poverty in old age. By co-partnership the business which keeps the worker during his time of activity is made to keep him also on his retirement; for the capital saved up will, if necessary, supply a pension. This benefit is not at all lessened by the national old-age pensions. Previously the thrift, care, and saving necessary to enable the worker to put by enough for a pension for himself and his wife, seemed altogether beyond his power; and, if exercised, it often tended to penuriousness and self-deprivation. The man denied himself the things that make life in any real sense, in order to prepare for an old age which would in consequence be empty, because he would have no resources for pleasure within himself. But now every penny saved does not go merely to stave off the workhouse or starvation temporarily, but is saved for actual future enjoyment. Saving now is no longer a drudgery, but can be a sane decision between the fulfilment of wants in the present and in the future. The workman, freed from the dark lowering cloud of an unprovided old age, will most certainly have far more chance of attaining efficiency and keeping his vitality during his working life.

These two propositions being accepted—(1) that the worker shall share in the profits, and (2) that this profit shall be accumulated as shares—it remains to consider how they can be applied in practice to municipal work, and more especially to municipal gas-works.

Profit-sharing is already practised in one municipal gas-works, as has been mentioned already; and the following are the conditions laid down.

No. 1.—ACTUAL SCHEME.

1.—That when the total cost of manufacture and distribution of gas shall be less than 10d. per 1000 cubic feet of gas sold, a bonus equal to one-fourth of the difference between that sum and the actual cost shall be divided among the workmen and clerks who have been employed in the Gas Department for not less than three months during the year in which the bonus has been earned.

2.—That in any year where special charges (such as main-laying operations) have been charged against revenue, instead of debiting same to capital account, the amount of such (correctly speaking) capital charges be deducted from the true manufacturing and distributing charges, in addition to the net cost of coal, rates and taxes, depreciation, and depreciation on cookers, &c., and that effect be also given to the profit and loss on gas-fittings.

[N.B.—The engineer does not receive a bonus.]

This is straightforward and simple; but it is only profit-sharing. The following is a suggested scheme for adding on capital-owning, and thus making the scheme much more allied to co-partnership. Shortly, the scheme proposes the formation of a Workmen's Investment Society, which in its corporate character shall receive the total dividends on wages, and, on the one hand, invest them in municipal stock, and, on the other, credit them to its members in proportion to the wages each one has earned.

No. 2.—SUGGESTED SCHEME.

1.—The employees shall form an Employees' Investment Society, registered under the Industrial and Provident Societies Act.

2.—The municipality shall fix a standard price for the gas, and agree to pay a yearly dividend on wages. The rate per cent. of this dividend shall rise as the cost of production falls, and *vice versâ*, in accordance with a recognized scale.

3.—The amount of this bonus shall be calculated on the sum of the total wages during the year, together with the total accumulated bonuses of the workers; these being reckoned only up to the value of the wages earned in the last year, half year, or other period agreed upon.

4.—The Employees' Investment Society shall be credited by the municipality with this total sum and a minimum rate of interest guaranteed to it.

5.—The Investment Society shall credit each member with his respective amount, and shall annually add to each member's credit a share of the total dividend calculated in proportion to the sum of the member's wages for the year added to his accumulated "dividends."

6.—The Investment Society shall have power to allow members to withdraw the whole or part of their capital. It is recommended that no employee shall withdraw any part of his holding in such a manner as to reduce his holding to less than the value of his ordinary wages for one year, a half year, or other agreed-upon period; except that the total shall be paid to him six months after his leaving the works in case of dismissal or departure to other work, and he may at pleasure withdraw it in case of retirement due to old age.

7.—The bonus shall not be allotted by the Employees' Investment Society to any employee who has worked for less than three or other agreed-upon number of months during the year; but such sum credited to them shall be kept by it in a separate account, as a benefit fund, from which help may be given to members in case of need.

8.—The municipality shall keep a separate account of all sums credited to the Employees' Investment Fund, and shall have power to use the money to lend to individual workmen, or groups of workmen, for building houses for members of the Society, or for other such purposes.

* See "JOURNAL," Vol. CXIV., pp. 52, 180.

9.—In calculating the cost of production for the year, expenditure which would ordinarily be charged to capital shall be spread over a series of years.

It is almost needless to point out how many benefits, besides the pecuniary ones primarily intended, will certainly gradually accrue from the association of the workers into a corporate unity. The Employees' Society will have a Committee, to which certain discretionary powers may well be given with reference to such matters as paying-out retiring members, admitting fresh ones, making loans to members, and the use of the reserve which will gradually accumulate, partly, perhaps, by direct allocation, and partly by the sums paid on wages earned by men who have been employed less than three months. The employees having thus obtained a machinery for self-expression, many of those small matters which tend to friction can easily be set right by discussion between (say) the chairman of the Employees' Society, and the manager or engineer, as the case may be. Thus, good relations will be fostered, to the benefit of all concerned—employees, managing committee, ratepayers, and consumers.

If for any reason it is thought undesirable that the employees should form an association, then the same result as to capital holding can be attained by the municipality granting loan stock direct to the individual employees. In the case of a company, there is felt by some people to be an objection to creating a large number of small shareholders whose presence at general meetings would, they think, be of no advantage to themselves or to the other shareholders, and also they could not well spare the time; whereas the few responsible delegates of an Employees' Society would clearly have a defined function, and it is found in practice that they are able to fulfil it satisfactorily. In the case of a municipality, this difficulty does not occur. The advantages of an Employees' Investment Society are mainly that it offers a centre and machinery for social work, provident and sick funds, and so on. In this case, the following rules are suggested.

No. 3.—Suggested Rules.

1.—The municipality shall fix a standard price for the gas, and agree to pay a yearly dividend on wages. The rate per cent. of this dividend shall rise as the cost of production falls, and *vice versâ*, in accordance with a recognized scale.

2.—The amount of bonus due to each employee shall be calculated in proportion to the sum of (*a*) his total wages during the past year, and (*b*) his accumulated bonuses; these being reckoned only up to the value of the wages earned by this employee during the past half year (or other period agreed upon).

3.—The municipality shall guarantee interest on further deposits from their workpeople at the current rate paid on municipal stock.

4.—The bonuses shall not be withdrawable; but the municipality shall have power to allow employees to withdraw the whole, or part, of their holding as it deems fit in the case of any individual application. In general, no employee shall withdraw any part of his holding in such a manner as to reduce his holding to less than the value of his ordinary wages for one year, a half year, or other period agreed upon; except that the total shall be paid to him six months after his leaving the works in case of dismissal or departure to other work, and he may at pleasure withdraw it in case of retirement due to old age.

5.—The bonus shall not be allotted to any employee who has worked for less than three months (or other period agreed upon) during the year; but such sum due shall be credited to a separate account, which can be used by the municipality for the general benefit of its employees from time to time, as it deems fit.

6.—In calculating the cost of production for the year, expenditure which would ordinarily be charged to capital shall be spread over a series of years.

EFFECTIVE GAS ILLUMINATION DEVICE AT NORWICH.

In connection with the Coronation festivities and the King's visit to the exhibition of the Royal Agricultural Society at Norwich last Wednesday, the offices of the British Gaslight Company were illuminated with a very effective device which is shown in the accompanying illustration. It attracted a great deal of attention; the movement of the flames giving much pleasure to the crowds of sightseers. The following were the dimensions: The crown was 20 feet diameter; the word "Coronation," 3 ft. 6 in. letters; "G. R.," 6-feet letters; the motto, "Long May He Reign," 2-feet letters. The whole was surrounded by a framework of star burners 55 ft. by 40 ft., surmounted by three flambeaux. The device was designed and erected under the supervision of Mr. W. H. Wayte, the Company's Outdoor Superintendent. The picture, for which we are indebted to Mr. Thomas Glover, the Company's Engineer and Manager, is interesting, as it shows the Company's offices behind the device, the church of St. Peter Mancroft to the right, and the other buildings surrounding the Market-Place.

Mr. C. R. Darling's Cantor Lectures on "Industrial Pyrometry."—In the report of the Council of the Royal Society of Arts, reference is made to the above-named lectures, which were noticed in the "Journal" at the time of their delivery. The Council say: "Mr. Darling gave a very full and clear account of the whole subject, including its history from the earliest attempts to measure high temperatures, and the first crude pyrometer of Wedgwood, down to the development of the very beautiful and accurate instruments which enable modern manufacturers to measure with certitude the precise degrees of temperature required for the manufacture of pottery, glass, iron, and steel, and for other processes in which extremely high temperatures are required. It is a point which may be noted with some interest that it is almost true to say that during very recent times the thermometric scale has been enlarged from a range extending merely from the solidification to the vaporization of water, to one reading from the absolute zero of temperature (−273° C.) up to, say, 1500° C.; that is to say, a scale of 100° C., from 0° to 100°, has been enlarged to a scale of nearly 2000°, from − 273° C. to + 1500° C. or thereabouts."

Projected International Smoke Abatement Exhibition.—Under the Auspices of the Coal Smoke Abatement Society, it is proposed to hold a Coal Smoke Abatement Exhibition at the Royal Agricultural Hall, Islington, from the 6th to the 18th of May, 1912. As the result of the preliminary announcement of the exhibition, we learn that much support has already been accorded to the undertaking. The exhibits will be divided into seven classes, the second of which will include those employed in domestic heating. Section B of this class will include gas fires and stoves, gas producers and generators, and heating and cooking appliances; while in Section B of the fourth class will be found suction-gas plants and gas and other engines for the generation of motive power. Conferences will be held in connection with the exhibition. In the first list of the Council are the names of Mr. James W. Helps and Dr. Samuel Rideal; and among the Vice-Presidents are Lord Rayleigh (the Chief Gas Examiner for the Metropolis) and Sir Oliver Lodge. The Organizing Manager is Mr. Frederick W. Bridges, of Balfour House, Finsbury Pavement, London, E.C.

ALKALI-WORKS CHIEF INSPECTOR'S REPORT.

THE Forty-Seventh Annual Report [for 1910] of the Chief Inspector under the Alkali Works Regulation Act, 1906, was issued last Wednesday. It is signed by Mr. W. S. Curphey, who early in the year succeeded Mr. R. Forbes Carpenter as Chief Inspector, on his resignation of the position on account of ill-health. Consequent upon this change, Mr. J. W. Young, B.A., B.Sc., who was previously resident in Manchester as a District Inspector, was appointed Inspector in Scotland, in succession to Mr. Curphey; and Mr. H. J. Bailey, F.I.C., of Pontypridd, was entrusted with the duties relinquished by Mr. Young. Mr. S. E. Linder, B.Sc., whose name has been frequently mentioned in the "JOURNAL" in connection with the important investigations initiated by Mr. Carpenter, has been retained by Mr. Curphey as his assistant.

In opening his first report in his new capacity, Mr. Curphey says he feels that his endeavours to continue the long series of interesting reports prepared by his predecessors call for forbearance. He then proceeds to state that the number of works registered on Dec. 31, 1910, was 1266. Of these, 70 only were works decomposing salt with evolution of muriatic acid, and so scheduled as alkali works; while the remainder—1196—carried on processes which were scheduled or were subject to registration under the Act of 1906. These numbers show a decrease of one alkali works, and an increase of four scheduled and registered works, compared with 1909—the net increase being three. There are also 168 works registered in Scotland; bringing up to 1434 the total number of works registered in the United Kingdom. The number of separate scheduled and registered processes under inspection last year was 1872, compared with 1857 and 1839 in the two preceding years. These figures show an increase of 15 compared with 1909. There is again a noticeable increase in the number of works manufacturing sulphate and muriate of ammonia; these accounting for seven out of the total net increase. The Inspectors paid 5868 visits to works, and carried out 6184 tests, compared with 5600 visits and 6252 tests in 1909. There was a decided fall in the acidity of the gases from all chimneys last year. It is satisfactory to find that no proceedings had to be taken against owners of registered works for infraction of any of the penal clauses of the Act, though in one instance serious warnings had to be given, which resulted in the owners taking satisfactory steps to prevent further undue escape of noxious gases. In two cases complaints were made against gas-works of causing offensive effluvia; and in both instances the sulphate of ammonia plant was regarded as a probable source. Independent local inquiry showed that in one case the source of annoyance was not associated with any part of the gas-works; while in the other every possible step had been taken to comply most fully with the requirements of the Act.

SULPHATE OF AMMONIA AND GAS-LIQUOR WORKS.

Mr. Curphey reports that the total number of processes of this class under inspection last year was 600—an increase of nine on the figures for the year 1909. Four of these were carried on in coke-oven works, and five dealt with the ammoniacal liquor from gas-works. Mr. Curphey remarks:

> In many ways this is an important class of works. It is by far the most extensive of any, in respect of the number of works coming under inspection; and the operations are frequently associated with the evolution of a most offensive gas. It is of interest, also, as sulphate of ammonia has as possible competitors the various chemical products through which the nitrogen of the atmosphere is now being brought into useful service in increasing quantities by the different methods which applied science has recently developed. An additional claim for attention is the probable expansion of ammonia production, owing to the further erection of recovery plants connected with the manufacture of coke and fuel gas. Recent improvements in the design of sulphate of ammonia plant suitable even for small gas-works is likely to add to the total of sulphate of ammonia production by enabling many small or inconveniently situated works to produce sulphate more economically than heretofore; while the recovery of this substance from peat continues to receive energetic attention, and may prove a further source of production. While there are many uses to which ammonia may be put, some of which are not inconsiderable, the great outlet is, and is likely to remain, agriculture.

RECOVERY AND PRODUCTION OF AMMONIA.

Mr. Curphey gives the customary statistics (for which he acknowledges his indebtedness to manufacturers) in regard to the production of sulphate of ammonia in the United Kingdom. They are as follows (in tons):—

—	1910.	1909.	1908.
Gas-works	167,820	164,276	165,218
Iron-works	20,139	20,228	18,131
Shale-works	59,113	57,048	53,628
Coke-oven works	92,665	82,886	64,227
Producer-gas and carbonizing works (bone and coal)	27,850	24,705	24,024
Total	367,587	349,143	325,228

These figures show an increase from all sources of supply, with the exception of that from iron-works, where the insignificant reduction of 89 tons has to be recorded. The net increase over 1909 was 18,444 tons. This was not so great as was the case between 1908 and 1909; but during 1910 prolonged strikes interfered seriously with the expansion which would otherwise have occurred from increased operations in coke-oven works. Nearly one-half the total production of sulphate of ammonia still comes from gas-works liquor. The small reduction noticeable between 1908 and 1909 has been replaced by an increase which brings the figure for 1910 well above that for 1908.

In the report for 1909, reference was made to the difficulties experienced in regard to the disposal of effluent liquors by their discharge into river courses. These difficulties continued last year; and they were an important factor in furthering the introduction of a new design of plant for recovering ammonia from coke-oven gases. By its use, any noxious gases associated with the production of sulphate of ammonia are retained in the fuel gases, and pass along with them to be consumed in the ordinary operations of the factory. A similar system of ammonia recovery was introduced into gas-works during the past year. In both systems, the whole volume of gas produced is passed through acid contained in a saturating vessel, and the discharge of an effluent liquor is avoided. But the conditions being different in the two classes of work, the recovery plant differs in detail. Mr. Curphey offers the following remarks on the system:—

> In this method of working, any sulphuretted hydrogen present proceeds along with the crude coal gas to be dealt with in the purifying plant before the illuminating gas is distributed to the consumers. A further advantage incident to this method of working which has a claim on the attention of all makers of sulphate from ammoniacal liquor is the absence of the necessity for storage and transference of such liquor. This advantage is twofold. In the first place, a possible source of much offence is avoided (in the past justifiable complaints have been made of objectionable effluvia arising from ammoniacal liquor stored in tanks); and in the second place, opportunity for a tangible loss of ammonia is avoided. In the case of underground tanks, this loss may arise and continue without being readily recognized. It is certain to arise, through the diffusion of the ever-volatile ammonia, in the case of ammoniacal liquor tanks which have a ventilating communication with the atmosphere. Loss in this way will vary with the degree of exposure to the air, the strength of the liquor, the duration of storage, and from other influences. That it may be considerable will be appreciated when one so familiar with the subject as Mr. John T. Sheard, of Sheffield, has estimated that in 24 hours, and with a still atmosphere, this loss may amount to as much as 3 to 5 per cent. of the whole amount exposed.* This tendency of ammoniacal liquor to part with its ammonia requires to be considered in analytical work also. Without due precaution, low results may readily be obtained by loss of ammonia through diffusion in the short time required for a direct titration of the volatile ammonia in a sample of liquor.

No alteration is recorded in the methods of dealing with the waste gases from the treatment of ammoniacal liquor in gas-works. The oxide of iron purifier is the agent most widely used for preventing the escape of sulphuretted hydrogen. Mr. Curphey says the "heap" form of this kind of purifier has many advantages over the older forms of box or walled purifier. In some cases, the distributing area provided for the gases after leaving the pipe conveying them to the purifier, and before entering the oxide of iron, seems small. This tends to create unnecessary resistance to the passage of the gases, and to throw back-pressure on the saturator. On the other hand, too large an area in proportion to the volume of the gases to be treated tends to local action in the purifier. Reference was made in last year's report to the erection in the latter part of 1909 of plant for the elimination of sulphuretted hydrogen from crude coal gas, and the recovery of the sulphur as a bye-product, according to the patent specification of Herr Walther Feld, which has already been noticed in the "JOURNAL." Mr. Curphey says the process never got beyond the experimental stage; and its operation was discontinued before he had an opportunity of seeing it in action.

SULPHIDE WORKS.

Last year, 66 works were registered as sulphide works. The great majority of these are works in which sulphuretted hydrogen is used for the formation of metallic sulphides for sale or for industrial use, or else in the course of purifying acids from metallic impurities. The customary method—and Mr. Curphey says it is a satisfactory one—for dealing with any small excess of sulphuretted hydrogen is by absorption in purifiers charged with slaked lime. The use of the lime purifier is, however, not so suitable in the case of some works included in this class; and in one case an alternative to the method of combustion now practised was sought for. This led to some laboratory work on which Mr. Linder prepared a memorandum, which is given in full in the report. The results are of interest as showing the great influence on the products of oxidation which is exerted by the base used to bring about the alkaline condition necessary for the reoxidation of lower oxides of manganese suspended in water.

Mr. Curphey concludes with an expression of appreciation of the successful manner in which his colleagues discharged their duties during the year, and of the valuable work done by Mr. Linder in carrying out the duties of the department. He adds

* See lecture to the Manchester and District Junior Gas Association, on "The Chemical Control of Gas-Works," given in the "JOURNAL" for Feb. 7 last (p. 373).

that "the good understanding which has always prevailed between manufacturers and inspectors continues to be a valued aid in the efficient administration of the Act."

The report of the Chief Inspector is followed, as usual, by those of the District Inspectors, some extracts from which are given on pp. 55-57.

THE INSPECTION OF FACTORIES.

In the last number of the "JOURNAL" we gave some extracts from the recently issued annual report of the Chief Inspector of Factories (Sir Arthur Whitelegge, M.D.); dealing more particularly with the reports of the District Superintending Inspectors. We now notice those of the Principal Lady Inspector (Miss Anderson), the Inspector for Dangerous Trades (Mr. W. S. Smith), and the Medical Inspector (Dr. Thomas M. Legge).

The report of the Principal Lady Inspector (Miss Anderson) contains extracts from reports made by the ladies acting under her supervision. Miss Paterson says:

> Much work has been done during the year to secure improvement in ventilation, temperature, and lighting. I am more than ever convinced that the temperature must be put right first if ventilation is to be improved. Miss Perry writes on this subject that the necessity for artificial means of ventilation in laundries is constantly showing itself. Most laundries of any size have now artificial means of ventilation in at least the ironing and machine room, but not always well applied. Only in a few cases was the ventilation in ironing-rooms, where hand irons were used, found to be in any way satisfactory. Either from leakage or from incomplete combustion, the air in these rooms invariably shows much sign of free gas. The matter is one which needs careful consideration by laundry occupiers. The introduction of high-pressure gas recently has seemed to result in some improvement. But this method is still in the experimental stage; and it has its detractors as well as its supporters. There is no doubt that direct ventilation from machines is capable, if well carried out, of removing all cause of complaint. In a laundry attached to a large hospital in London, the work has been excellently done, and the air is completely free from gas. The gas hand-iron, however, presents its own difficulties—all the more that it is often under the control of someone who only imperfectly understands how to keep it in order. One or two defective irons can make things very unpleasant for a roomful of people.

Referring to producer gas, Miss Paterson says its use in the ironing-rooms of laundries is not common, and the effect of any leakage or defect in the plant may be so serious that one is not anxious to see its use extend. Its introduction into two large laundries in London gave rise to a good deal of sickness during the past year. Her attention was called to it by a doctor, and investigation showed that the effects had been serious. The gas was used for the irons and for the ironing-machines (except those heated by steam), and also for gas-stoves provided in the messroom. The women affected suffered all in much the same way—headache, palpitation, and in some cases loss of consciousness. Miss Paterson says there is an unpleasant "taste" in this gas which the workers dislike; and when its use was given up in both laundries, she was begged to see that it was not started again, in spite of its use having been the cause of a reduction of 50 per cent. in the amount charged for gas to the ironers. The introduction of gas containing so large a proportion of carbonic oxide into a room, and its distribution, it may be, to a hundred different points, involving its passing through pipes, joints, and taps, is a source of danger unless all the plant is kept in better order than in the average laundry. Another Lady Inspector says the general ventilation of laundries may be good, even where gas-irons are in use. From thirteen representative laundries, all using gas-irons, a number of air samples were taken. The highest proportion of carbon dioxide found in 32 samples was 11·6, and the lowest 5·4, parts per 10,000. These results are stated to be very satisfactory. In one laundry, producer gas is used for heating irons and ironing-machines; and here the workers appear to suffer from the effect of the fumes, leakages from defective joints and connections, and incomplete combustion of the gas. It is considered probable that a combination of both accounts for the fumes; and it is pointed out that if the use of this gas is to be continued, very good mechanical ventilation must be provided, and great attention paid to joints and connections.

The report of the Inspector for Dangerous Trades (Mr. W. S. Smith) contains some remarks on the subject of purifiers in gas-works. Owing to the occurrence of serious fires and explosions resulting in accidents from time to time to workmen engaged in emptying these vessels, he made inquiry as to the precautions taken in some of the gas-works in London and the immediate neighbourhood. As a result of his inquiries, he reports as follows:

> In some works it is necessary to empty each purifier after a month's working; in others, the period may be two months or more. A special gang of men is usually constantly employed, on piecework rates, for this work. Care is required in handling the spent oxide, as it readily oxidizes on exposure to the air, and may by spontaneous combustion give rise to fire or explosion if the material contains residual coal gas or explosive mixtures of gas and air. For this reason, the purifiers are emptied as quickly as possible. . . . Special precautions are taken in some of the larger works to ventilate and free the purifiers from residual gas, either by blowing air for a few minutes through the purifier before the cover is raised, or by exhausting the residual gas with an exhaust-pump. Where these or similar means are taken, it is usual to find that the men enter the purifier as soon as the cover is removed. In works where no special means exist for ventilating the boxes, a period of time is allowed to elapse before the men enter. As a rule, the removal of the cover takes from 15 minutes to an hour, according to the size of the box, its construction, and the type of lifting appliances. The men enter about half an hour afterwards. In a few works, the cover is lifted the previous evening; but some managers object to this practice, on the ground that the supervision may be less at night, and other unforeseen accidents may occur. In works where carburetted water gas is manufactured, greater danger is recognized at the purifiers used for this gas, owing to the high percentage of carbon monoxide present. It is the universal practice before emptying such purifiers either to blow air through for a number of hours, and in some cases to continue blowing while the men are at work within the box, or to remove the covers at least 24 hours before the men are allowed to enter.
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> The following other general precautions have been noted at different works: The purifiers are either in the open or in well-ventilated sheds or buildings; no lights are allowed, except electric torches or lamps; the work of emptying and recharging is always done during daylight; hose-pipes and a water supply are kept close at hand to extinguish outbreaks of fire; and the outlet and inlet connections of the boxes are usually water-luted, when work is necessary within the purifiers, to prevent accidental leakage through the valves. A hole is often made through successive layers of the oxide at one part of the box, before emptying operations are commenced, to facilitate the escape of any residual gas from pockets; and in some works, such holes are tested for gas by a gas-indicator. Pressure-gauges are fitted to many purifiers; and these serve to detect leakage of gas before the removal of the covers. Steam is blown through the purifiers in a few works, for an hour or more, before the boxes are shut off, in order to damp the material. To prevent sparking, the use of picks is often forbidden, either entirely, or near the sides of the boxes, or in the neighbourhood of the cast-iron standards which support the wood grids. All iron bolts and nuts used in the construction of the grids are covered over with wood; the men often wear copper foot-plates on their boots; and the oxide is riddled to remove stones.

Mr. Smith says the majority of gas managers are fully aware of the dangers at the purifying plant, and all take some of the above-named precautions. The men, as a rule, are conversant with the work, and understand the risk of fire, explosion, and gassing. Accidents appear to be few. At one works, with fifty purifiers, 300 boxes are emptied and recharged per annum, and there has never been an accident. It has been suggested that the risk would be reduced to a minimum if the purifiers were first blown out with an inert gas, such as ordinary furnace gas, and afterwards for a few minutes with air, before the covers are removed; but Mr. Smith has not heard of any works in which inert gas is so used. Some managers object to blowing air through the boxes, on account of the tendency to increase the oxidation of the spent material.

The report of the Medical Inspector (Dr. Thomas M. Legge) contains, under the heading of "Fumes and Gases," the following tabular statement of the number of cases of "gassing," or of accidents (sometimes fatal) immediately attributable to the state of unconsciousness induced thereby, and the nature of the fumes or gases giving rise to them, reported during the past year. Comparison is made with similar totals for two previous years. The principal figures relate to all cases—fatal and non-fatal; those in parentheses to fatal cases only.

Nature of Gas or Fumes.	1910.	1909.	1908.
Carbon monoxide	53 (9)	53 (6)	55 (5)
(*a*) Blast furnace	19 (7)	6	26 (3)
(*b*) Power (suction, producer, Mond, Dowson)	25	25 (4)	19 (2)
(*c*) Coal	4	11 (1)	9
(*d*) Other	5 (2)	1 (1)	1
Sulphuretted hydrogen	2	5 (2)	8 (1)
Carbon dioxide	2 (1)	2 (2)	4 (3)
Chlorine	2	1	1
Nitrous fumes	11	12 (2)	3 (1)
Dinitrobenzol	18	4	2
Benzol	..	1 (1)	2
Other	4	4	3

While on the subject of "gassing," it may be mentioned that two cases are referred to by Mr. John Law (Blackburn) as having occurred to men engaged in cleaning out the scrubbers in gas-works. On investigation, it was found that a smoke-helmet, with air-bellows, was provided for use; but, the foreman being away on a holiday, the men did not trouble to put the helmets on. He also refers to risks to which men are exposed who have to clean out and renew oxide in purifiers, owing to possible accumulations of sulphuretted hydrogen. One death was alleged to have been due to this cause; and though there was no direct evidence at the inquest to confirm this, Mr. Law considers it desirable in such cases that chemical respirators be provided and worn.

Reverting to Dr. Legge's report, he says great difficulties present themselves in attempting to classify industrial poisons satisfactorily. Classification should take account of the relative toxicity of the compounds, and of the various processes in which they come to be used; and if it is not to lead to erroneous conclusions, it must be complete. Otherwise failure to mention any may lead to the assumption that those omitted are harmless.

The report of the Electrical Inspector (Mr. G. Scott Ram) does not call for notice here. It was dealt with in "Electricity Supply Memoranda" last week.

SPECIAL ROAD CLAUSES IN GAS ACTS.

By Arthur Valon.

For some years past local authorities charged with the duty of maintaining the public roads have made persistent endeavours to supersede the provisions as to the laying of mains contained in the Gas-Works Clauses Acts, by special clauses inserted in the Private Acts authorizing the operations of individual companies. It is somewhat remarkable that the authorities who are most insistent are, as a rule, those that are least affected by the operations of a gas company. If the restrictions upon the gas company were in reality ineffective and insufficient, and the powers of the road authority inadequate, it would be natural to expect that the road authority of the urban area within which the company supplied gas would be the first to feel the necessity of further powers, and the foremost in asking for them.

As a matter of fact, it has been comparatively rare for any extension of the provisions of the General Acts to be demanded by the authorities of the urban area within which the company supplies gas. Occasionally a rural district council took action; but the bulk of the applications have been made by the county councils in regard to main roads. That these authorities should take the lead is perhaps not surprising, in the absence of any serious deficiencies in the existing law. It is apparently a universal, and certainly within reasonable limits an admirable, characteristic of the British official to endeavour to increase the importance and authority of the body which he serves; and, added to this, there is a tendency, which seems inherent in the official mind, to regard a public body as an entity altogether independent of the electorate which appoints it. Perhaps it may be these two influences working together that lead to the attempts made to render as nearly absolute as possible the authority of particular bodies within their spheres of action, regardless of the rights of others within the same spheres, and sometimes without respect to the interests of the electorate represented.

To furnish the proper corrective to these aberrations is one of the functions of the representative body. But as the influence of the bureaucratic element is always stronger the wider the area from which the representatives are drawn, it is not difficult to see that arbitrary powers are less likely to be sought, in the first instance, by more purely local bodies than by the county councils. "In the first instance" is said advisedly, for the suggestibility of the human being, or the imitative instinct of mankind, whatever may be the correct term used by psychologists to denote a well-known phenomenon, is quite sufficient to ensure the widespread adoption of an idea with the prestige of such a body as the county councils behind it.

It would indeed be interesting to know how far the desire to amend the existing provisions arises from difficulties which a particular authority has experienced, and to what extent it has been occasioned by some organization or association to which such authorities or their officials may belong. The movement has gathered like a snowball; and at the present time corporations, district councils, and other public bodies, railway companies, and even private individuals, have all joined in the scramble for so-called protective clauses. To so absurd a pitch has it been carried, that in an Act passed last session consisting of 18 pages, 14 pages were occupied by clauses for the protection of four public authorities, two railway companies, and one private individual. Each had a separate set of clauses—in many cases dealing with the same matters in different terms and by different methods.

In a recent case in which the writer was engaged, the county council witnesses admitted that no difficulties had occurred with the gas company whose Bill was under discussion; but they were anxious to get new provisions inserted to serve as a precedent in other cases. Not a very conclusive reason for the insertion of special provisions in a Private Act! It was also admitted in the same case that the county council desired to have special clauses proposed by them inserted in all Bills promoted by gas-works; thus showing that what was asked for was looked upon as of universal application, and consequently should properly take the form of an amendment of the general law.

In 1903, thirty-six gas companies promoted Bills or Orders. Of this number, nine contained some special provisions in regard to roads; while twenty-seven left the general law unmodified. In 1910, of the twenty-five Bills and Orders promoted by gas companies, special road clauses were inserted in nineteen; and only six left the general law unaltered. Dealing with county councils only, in 1903 special clauses for their protection were included in six only of the thirty-six Acts and Orders; but in 1910 the proportion had increased to eighteen out of twenty-five. The decisions of the Parliamentary Committees, given after the case has been fully argued before them, are not the causes of this success. On the contrary, the decisions have not been at all encouraging to the county councils. The results have been attained by attacking the companies in detail.

Promoters of Private Bills, finding themselves faced with strong opposition to the main purposes of the Bill, often endeavour to concentrate their defence by compromising or giving way to opposition on points which seem to them of subordinate importance, without regard to the reasonableness or justice of the point itself. On the other hand, where a Bill is unopposed except upon details, promoters are generally willing to settle the matter by concession so as in order to avoid expense. This last consideration weighs very heavily with a small company, to whom perhaps the concession of clauses will not mean any very serious immediate liability.

Now although it may be quite true that clauses inserted by agreement may be considered as a bargain between the opponents, and not as a precedent for their compulsory insertion by the Committee against the wishes of the promoters, it is not possible to ignore altogether that, for some reason or other, most of the Acts as passed have contained some or all of the clauses asked for. Such a consideration must have some weight with a Committee, and a weight which will increase with the number of Acts containing the provisions.

It therefore seems time for gas companies to consider whether they are willing to have the existing regulations as to the opening of roads and the laying of mains amended according to the ideas of the county councils, as embodied in the special clauses usually put forward on their behalf; for this is what it may come to. If all, or the overwhelming majority, of Acts contain the clauses, it will hardly be possible to resist the conclusion that they are recognized as reasonable, and should be applied to all companies and all roads by an amendment of the general law.

Let us consider what it is that the road authorities want, and how far their requirements are reasonable. The privilege of laying mains in public roads, and over public bridges, is given to authorized gas undertakings by section 6 of the Gas-Works Clauses Act, 1847, and in that, and the following clauses, are laid down the provisions which must be observed when the privilege is exercised, the liability of the company to make compensation for damage done, and the penalties that may be incurred by infraction of the provisions of the Act.

All work in public roads must be done under the superintendence of the road authority, after they have received three days' notice, and in accordance with a plan to be approved by them. Should the authority disapprove the plan, and propose another, then, failing agreement between the parties, the plan is to be decided by two Justices. It is generally sought by the road authority to substitute seven days for the statutory three days' notice, and to provide that the plan shall be sent to them 14 days before the work is to be begun. It is not improbable that difficulty may have been experienced by the authorities in dealing with notices of important work in the short space of three days; and as the officials of gas undertakings would not be likely to find any serious trouble in giving the longer notice, there seems no reason to object to it.

Other amendments are sometimes sought which specify the scale of the plan, and direct that it shall be accompanied by a section, and shall show the method by which it is proposed to carry out the work. It has already been decided by the Courts that, under the existing law, the plan specified must show the depth of the proposed main, and the mode in which the underground work is to be executed. Further directions would seem to be superfluous, and the reflection is suggested that either those who ask for more detailed directions are unaware of the decided cases, or are desirous of obtaining the insertion of some clause or other regardless of its utility, in order to show that their endeavours have not been entirely fruitless.

Some propositions indicate also that the provisions of the Gas-Works Clauses Acts themselves are not always known. It is quite a usual thing for a clause to be asked for giving the road authority power, when the road has been opened by the gas company, to reinstate the ground in case of delay or omission of the company to do so, charging the company with the cost—despite the fact that section 6 provides that the company shall make compensation for any damage, and section 12 gives power to the authority to do the necessary work at the expense of the gas company in case of their default.

There is no doubt that promoters will generally be willing to accede to the insertion of clauses which do not add to their liabilities, if by so doing opposition can be diminished or avoided. It is, however, desirable to prevent the insertion of superfluous provisions, if only to evade the possible argument that an apparently supererogatory clause must mean something beyond the general law or it would not have been inserted.

As well as the foregoing, there are other provisions generally demanded which are superfluous. A clause setting forth that the company is not to interfere with the structure of any bridge without the consent of the authority (such consent not to be unreasonably withheld), is already covered by the regulations providing that no work is to be undertaken except in accordance with the approved plan; while the provision that the company is to compensate the authority for any damage done, owing to the traffic being concentrated upon one part of the road during the time that the trench is open, would seem to be covered by clause 6 of the General Act, which states that compensation is to be made for any damage done. That such a clause should be sought for may possibly arise from an idea that whereas the onus of proof of damage under the General Act would rest upon the road authority, in the case of the special clause it might be taken to imply the probability of damage; thus involving the undertakers in the proverbial difficulty of proving a negative.

The Gas-Works Clauses Act deals with the whole question in such general terms as may be applied to all cases which may arise, and particular directions which may not be generally applicable are pointedly omitted. Parliament apparently thought that the road authority and the gas company could settle these matters between them as the need arose, and that in cases where disagreement occurred it could be fairly settled by reference to a

tribunal composed of two justices. It will probably be admitted that this procedure has, on the whole, worked very well, and that instances of serious disagreement between the gas company and the road authority are not at all common. The road authorities, or their officials, unfortunately, do not seem to be satisfied with this, and evidently desire that rigid conditions should be specified in the Act, regardless of their necessity in every case.

For instance, it is usual for a petition to ask that a minimum depth should be prescribed at which all mains should be laid; and this minimum depth is attempted to be fixed so that it is scarcely possible for it to be necessary to lay any main lower than this for the sake of safety, although quite possibly many mains might be laid at a shallower depth and still be safe. Although this is the most usual point upon which detailed directions are desired, sometimes a great deal more than this is asked; and in one case at least the Act contains an exact prescription of the method to be followed in opening and reinstating the road, even down to the direction that the company shall fill in, and properly ram to the satisfaction of the county surveyor, any trench or excavation made.

Then, following the usual trend of officialism, it is attempted to substitute for the principle of agreement between the authority and the company the right of the authority's officials to settle the matter themselves, as shown by the provision that the main is to be laid in such position in the road as may be directed by the surveyor. The same tendency is also seen in the request commonly made for a clause providing that the company shall keep their pipes in proper repair, and that any defect appearing shall forthwith be remedied on notice given by the authority—the company compensating the authority for any damage due to the defects. These matters are all dealt with in the General Act, but without, of course, any special discrimination in favour of the county council. It is difficult to see any object in the suggested addition, unless it be to exalt the apparent importance of the council's officials; for clause 24 of the 1847 Act puts a penalty of £5 per day upon the gas company for any escape after twenty-four hours' notice has been given to them in writing, while clause 29 provides that nothing is to prevent the undertakers from being indicted for a nuisance, or to any legal proceeding to which they may be liable in consequence of making or supplying gas.

Important as the foregoing matters may be to gas companies generally, it may possibly be considered that the alterations proposed in the existing practice are, in the main, more matters of procedure than of principle, and that where the proposed provisions are redundant they cannot very seriously affect a gas undertaking's position. The authorities, unfortunately, are not content merely to deal with such matters; they endeavour also to alter the present position of affairs to their own advantage by divesting themselves of liability which at present rests upon them, and transferring their responsibility for certain expenditure to the gas company. Thus it is usual to ask that when a road or bridge is altered, no matter to what cause such alteration may be due, the cost of altering the pipes and maintaining the supply should be paid by the gas undertakers; while if the presence of the pipes increases in any way the cost of the alteration, the undertakers are also to bear such increase in cost.

Whether or not such an arrangement would be as fair as that at present existing, it is a complete innovation on the current practice, which is that, whenever it is necessary to move or alter works lawfully constructed, the authority requiring such alteration shall meet the resulting expenditure. The same principle governs the relations of all bodies possessing the privilege of constructing works in or beneath the public roads. For instance, section 153 of the Public Health Act, 1875, states: "Where for any purpose of this Act any urban authority deems it necessary to raise, sink, or otherwise alter the situation of any water or gas pipes, mains, plugs, or other water-works or gas-works laid in or under any street . . . the expenses of or connected with any such alteration shall be paid by the urban authority."

It is not to be expected that the road authorities will view this question in exactly the same light as that in which it appears to a gas company. The authorities, charged with the maintenance of the roadway, are apt, quite naturally, to look upon themselves as owners of the highway, and to consider that all public companies who, in the course of carrying on their business, interfere with the roads should do so at their own risk, and without any right to compensation for any damage to their property arising from any otherwise lawful action on the part of the authority. Given the premises, such a claim would not appear on the face of it to be unreasonable. The authority is not, however, in exactly the position of owner. It is true that duties devolve upon them which usually fall to the lot of owners; but the privileges they possess are not the full privileges of ownership. One of their duties is to maintain the roads for public use—providing the cost by levying a rate on the occupiers of the district. The owners of wheeled vehicles using the roads do not necessarily pay anything towards their maintenance; and in some cases the heaviest wear on the roads—more particularly the main roads—is caused by vehicles not owned by ratepayers within the district.

It may be suggested that the use of the subsoil to accommodate pipes, wires, &c., is a use of the road to the public advantage, and just as legitimate as the use of the surface for traffic. So far as the gas company interfere with the surface of the roadway, they are bound to repair any damage, and so prevent any permanent depreciation of its value to those who use it for its original purpose as a means of communication. In like manner, when an alteration of a road or bridge is undertaken to meet the increasing needs of the surface users, any damage occasioned to the underground users should form part of the cost of the alteration.

The last point in what appears to be the general programme of the council's legislative campaign is an attempt to abolish the right of compensation for damage to pipes which may be caused by the use of a steam-roller. So far as regards pipes laid at the present time, any such provision is unnecessary; the work must be done in such a way as to meet the conditions which exist. The use of steam-rollers is now universal, and risk of damage must be provided against. What is aimed at, of course, is to prevent any liability for damage to pipes which have been laid down before the introduction of steam-rollers. It is doubtless annoying not to be able to use the best method of repairing roadways without becoming liable for damage to pipes which have been laid in former days. But it should be remembered that the work has been done according to a plan approved by the authority; and it would be unfair to penalize the company for not providing against a contingency that could not reasonably be foreseen.

The position is not very dissimilar to that in which the authorities themselves are placed in regard to old bridges which are unfit to carry heavy loads. It may be inconvenient to owners of locomotives to be debarred from using such bridges; but if they do use them, and damage result, they will be liable to make compensation. It is also, the writer believes, not unheard of for claims for compensation to be made by the authorities themselves when the surface of a road has been seriously damaged by very heavy traffic for which it was unsuited.

In this parliamentary session, the demands of the road authorities have been resisted by two companies with complete success. The Tamworth Gas Company, and the Enfield Gas Company, not being content to accede to the demands of the County Councils, fought the matter out before Committee; and in neither case was any provision inserted in the Bills different from those contained in the general law, except in so far as the promoters themselves expressed their assent. In the case of Enfield, the Middlesex County Council asked for all the clauses to which reference has been made, and, in addition, others dealing with matters such as the price of gas supplied to the schools. The Company stated to the Committee that they did not object to:

(*a*) Seven days' notice instead of three, for the purposes of section 8 of the Gas Works Clauses Act, 1847.
(*b*) Plan required by section 9 of the General Act to be sent fourteen days before commencing work, except in cases of emergency and laying of consumers' services.
(*c*) To limit the length of trench open at one time.
(*d*) Council might repair road or bridge, if Company neglect, and charge the Company with cost of same.
(*e*) Arbitration clause.

Clauses embodying these provisions were inserted; and the Committee rejected the rest, after a hearing which extended over two days, when the whole matter was very fully discussed.

It is to be hoped that these successes will encourage other companies to resist the unreasonable demands of the county councils. It is a pity that a question such as this, of general importance to all undertakings, should be settled by the action of individual companies acting alone. Sticks may be broken easily enough separately, which bound together in a bundle offer a much tougher problem. The whole matter adds another illustration to the many already existing of the need for an authoritative body fully representative of the gas industry to deal with such questions. May we not have long to wait for it.

The King on the London Water Supply.

On the return of Their Majesties the King and Queen after their visit to the City last Thursday, a halt was made at the New River Head in Rosebery Avenue, to admit of the presentation of an address from the Metropolitan Water Board. Mr. E. B. Barnard, the Chairman of the Board, presented the address, which set forth that it was at the New River Head that the citizens received centuries ago, at the hands of Sir Hugh Myddelton, and had ever since enjoyed, the bountiful supply of pure water which he was enabled to bring to them by means of the Royal sympathy and financial succour of King James the First. His Majesty's reply, which was handed to the Chairman, was as follows: "The Queen and I thank you very sincerely for your loyal and dutiful address, and for your prayers and good wishes. I am well aware of the extreme importance of the duties entrusted to the Metropolitan Water Board, and of the difficulties which have been successfully surmounted in ensuring to the population of London a continuance of that pure and abundant water supply upon which the health of the Metropolis largely depends. Dwellers in London are perhaps too ready to accept this great boon as a matter of course; and it is well that we should have an opportunity of acknowledging the great debt we all owe to you and to your predecessors, and, above all, to Sir Hugh Myddelton, for the enterprise and energy which have contributed to make the water supply of London the finest in the world."

The Late Mr. W. J. Jenkins.—The Council of the Society of British Gas Industries, at their meeting on Monday last week, passed a resolution expressing their regret at the death of their friend and member Mr. W. J. Jenkins, and their sincere sympathy with his firm and relatives in the great loss they have sustained.

THE INTERNATIONAL HYGIENE EXHIBITION AT DRESDEN.

THERE is this year being held at Dresden an exhibition which approaches in size and popularity the exhibitions at Shepherd's Bush with which the expression "White City" has become identified in recent years. It occupies an area of about 79 acres, mostly enclosed from the large park known as the royal "Grosser Garten," which is the largest and best wooded of the attractive public gardens in which Dresden abounds. The title of the exhibition seems liable to convey a wrong impression of the nature of the exhibits. Sanitary appliances form a quite inconsiderable section of the whole. Moreover, the national exhibits are of a purely scientific and statistical character; and the industrial sections are distinct and on a comparatively minor scale.

It seems desirable to take the opportunity of giving this explanation, because it falls within our knowledge that when an appeal was made a few months ago for subscriptions for the object of establishing an English section at the Exhibition, the impression was rife that it was mainly a matter of assisting British makers of sanitary appliances, &c., to display their wares, and that they might well be left to further their commercial interests without extraneous aid. As a fact, the National Pavilions at the Exhibition have no space at all devoted to commercial exhibits. They are concerned solely with the relation of hygiene in its broadest sense to the public weal, and include models, plans, specimens, and statistics relating to the provisions made by state and municipality for guarding the health of the people in matters such as water supply, lighting, town planning, the construction and ventilation of buildings, the disposal of sewage, hospitals and sanatoria, both permanent and temporary, the combating of epidemics, education of children, and the construction, lighting, and ventilation of schools, the control of food supplies, clothing, street cleansing, refuse disposal, and the provision of public baths and gymnasia. The Governments of the following countries have furnished exhibits on these lines for their respective pavilions: Austria, Brazil, China, France, Hungary, Italy, Japan, Russia, Spain, and Switzerland. Further, as the British Government refused to provide a national exhibit, a Committee (hastily formed a few months ago) have collected funds for the provision of an English pavilion and exhibits. Up to the time of writing, this pavilion has not been opened to the public; but its equipment appears to be in an advanced state, and is being rapidly pushed to completion. The English pavilion is to include, *inter alia*, sections relating to ventilation, heating, water supply, sewage disposal, bacteriology, industrial poisoning, rescue appliances, school and military hygiene, town planning and building, sanatoria, and cancer research. The chief exhibitors are the London County Council, the Metropolitan Asylums Board, the Lister Institute, the Rural Housing and Sanitary Society, and the Liverpool and London Schools of Tropical Medicine. The English section naturally, however, in the absence of Government aid, is not so large or so representative as the national sections of several other countries. Of the latter, Japan provides perhaps the most generally attractive and interesting, and France the most tastefully decorated, of the pavilions.

Apart from the national exhibits, there are many sections of great general interest. The historical section, which is accommodated in one of the largest of the buildings, contains exhibits of methods of heating and lighting and of water supply in the earlier times, in the middle ages, and at the present day. There is a section relating to industrial insurance; and in the sub-section on accident insurance, the Organization of Gas and Water Works of Germany contributes statistical information. It will be remembered that some particulars of the incidence of fatal and serious accidents on workers in gas-works were given in the "JOURNAL" a short time ago, from figures quoted and arranged by Dr. W. Leybold, of Hamburg, from the statistics of this organization. The whole of the gas and water works of Germany are compelled by law to pay the levies demanded by this organization, which is controlled by a Managing Committee appointed by the works managements. The disbursements are made, as required, on the authority of this Committee. Some idea of the magnitude of the operations of this accident insurance organization may be gathered from the facts that the amount paid in wages to workmen coming under its cognizance was, in the year 1909, 88,263,083 marks (about £4,326,600), that its available funds (including reserve) amounted in that year to 1,283,839 marks (about £62,930), and that it paid out in indemnities 896,729 marks (about £43,960). There are also given in the insurance section of the exhibition many statistics of an interesting character of the sick, invalidity, and old age insurance schemes which have been in operation in the German Empire for the last twenty-five years. A special monograph dealing with the subject has been prepared in view of the exhibits in relation thereto at the Dresden and Turin Exhibitions, and should prove of special interest at the present time in connection with the Bill which is before Parliament.

An exhibit by the Dresden Technical College includes a large collection of lamps and burners intended to show the gradual advance made in methods of lighting. It also includes diagrams showing the light emitted in a vertical plane by various modern sources of light, and the heat and carbonic acid evolved by them. These diagrams do not include (so far as we have observed) high-power gas-lamps, and convey the impression that the electric arc is without a rival where lights of high intensity are required. Some tables and photographs prepared by Dr. Stockhausen display very clearly, however, the hygienic inferiority of the electric arc light due to its intense surface brightness and its large proportion of ultra-violet radiation. Diagrams supplied by the firm of Schott and Co., of Jena, show the general correspondence in composition of the light of the incandescent gas-burner with daylight. The German Welsbach Company have supplied some interesting sections of incandescent gas-burners.

There is a photometer-room equipped with a steel bar photometer and Hefner lamp, and a number of specimens of different types of incandescent burners and screens for use with them. There is also a small room equipped as a gas laboratory, with the more usual apparatus for the analysis of samples of gas—a Junkers calorimeter of the more recent type, in which the two thermometers are arranged at the same level, as in the Boys calorimeter. In the section of the exhibition devoted to heating and ventilation, the German Association of Gas and Water Engineers have a number of exhibits, including a model house for investigations on the effect of wind, steam-heating plant fired by gas, and various devices for avoiding down-draughts in the flues of gas-fires, &c. There are also other examples of gas heating and cooking apparatus, and a Junkers recording calorimeter. Drawings are exhibited of gas lighting, heating, and ventilating plant for churches, theatres, hospitals, and schools; several of these representing existing installations. The Corporation of Dresden show a diagrammatic model of the quantitative relations subsisting between the products obtained by carbonizing coal.

The industrial exhibits include a large display of the gas heating and cooking appliances manufactured at the workshops of the German Continental Gas Company at Dessau; and the apparatus for heating, &c., by gas, produced by the firms of Junkers and Co., of Dessau, G. Meurer, Friedrich Siemens, and the Eschebachs' Works, all of Dresden, and Houben Sohn, of Aix-la-Chapelle. There are some smaller displays of gas heating apparatus; and the Mannesmann and other steel tube makers have many exhibits of interest to gas and water engineers. A scheme which was at one time projected for a special exhibition on a large scale to be arranged jointly by the German Association of Gas and Water Engineers and the Central Organizatic for Promoting the Use of Gas, unfortunately did not come to fruition. There is also an almost complete absence of British firms among the exhibitors throughout the industrial sections of the exhibition.

There are some good displays of gas lighting in the grounds of the exhibition. A compressing plant by Messrs. Julius Pintsch, of Berlin, serves to supply high-pressure gas to a large number of lamps; and the German Welsbach Incandescent Gas-light Company have a large number of their lamps, both within the grounds and in the Lennestrasse outside the main entrance to the exhibition, lighted by the Pharos compressed-air low-pressure gas system. In another part of the grounds are several high-power petroleum incandescent lamps. There is in the power engine pavilion an 80-H.P. Deutz engine of the Diesel type, working with tar oil. The Swiss pavilion contains tables exhibited by the Swiss Association of Gas and Water Engineers, showing the development of the more important gas undertakings of the country during the thirty years ended in 1910. These indicate that the gas consumption of Switzerland has risen from 14,984,000 cubic metres in 1880 to 133,400,000 cubic metres (4,710,000,000 cubic feet) in 1910. The average consumption of gas per head of the population is 3550 cubic feet per annum.

There are very many exhibits relating to water supply, provided for the most part by municipal authorities. Curiously enough, there are comparatively few relating to the question—of great hygienic, as well as economical, importance—of the suppression of dust on roadways. From Baden, there are specimens of roadway treated with an emulsified tar, and sections of tarred-macadam and surface-tarred roads. In these sections, a thinner tar appears to have been used than the heavy tar which is now adopted by most English road surveyors; and it would seem probable that they would not have the requisite firmness to withstand heavy traffic in warm weather.

In regard to the remarks made earlier as to the English pavilion not yet being open to the public, it should be added that the formal opening took place on the afternoon of Thursday last. The British Minister Resident in Dresden, Mr. Arthur Grant-Duff, delivered an inaugural address, and declared the pavilion open. Dr. Armit, of the Lister Institute, who has been responsible for the arrangement of the exhibits, also spoke; and there were present representatives of the Canadian Government, Liverpool School of Tropical Medicine, and the Imperial Cancer Research Fund. In addition to the bodies already named as having contributed largely to the exhibits, the Birmingham Corporation deserve special notice for their views, diagrams, and models of schools, hospitals, model dwellings, &c.

The Metric System.—We have received from the Decimal Association, Finsbury Court, E.C., a pamphlet containing a summary of official reports on the metric system. It is to a large extent a reprint of one written anonymously in 1908; but as it is stated to have aided the movement for the general adoption of the system, the author now appends his name—Mr. John H. Twigg. The summaries are preceded by an explanation of the system, and diagrams showing a decimeter long divided into centimetres and millimetres, and a square and a cubic centimetre.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

FIFTY-SECOND ANNUAL GENERAL MEETING AT DRESDEN, June 26 to 30.

[By Our Special Representative.]

A REVIEW OF THE PROCEEDINGS.

The Fifty-Second Annual General Meeting of the German Association of Gas and Water Engineers, which opened on Monday, the 26th ult., at Dresden, secured an exceptionally large attendance of members and friends, owing to the co-operation of a number of causes. In the first place, Dresden is always a popular city with visitors from other parts of Germany and Europe generally, owing to its pleasant situation and surroundings, the art treasures which it contains, and the air of unostentatious and evenly distributed prosperity and comfort which pervades it. Secondly, there is this year established in Dresden an exhibition which, though nominally and really of a one-sided character, covers a greater area than the Brussels Exhibition last year, and has its exhibits so well chosen, arranged, and displayed that it is drawing immense throngs from places far and near. Thirdly, and lastly, the meeting of the Association in 1910 was at Königsberg, which, by reason of distance from most parts of Germany, failed to attract many almost habitual visitors to these annual gatherings; and consequently interest revived with the greater vigour in last week's meeting. The attendance amounted to about 1050 persons, exclusive of the local and other specially honoured guests of the Association, but inclusive of nearly 200 ladies accompanying members. For these, a special programme of excursions, &c., had been arranged for the hours when the technical proceedings of the meeting were being carried on.

The customary reception and assembly of those attending the meeting took place on the evening of Monday, when the Town Council of Dresden entertained the members and guests of the Association in the large banqueting hall of the Exhibition. This hall allowed of the thousand odd persons present enjoying an excellent meal at tables which were not overcrowded, whereas the hall at the new Rathaus, where the Town Council ordinarily entertain, could not have seated so large a number in comfort. The chair was taken by Dr. Kretzschmar, one of the Burgomasters of Dresden, who was supported by several members of the Town Council, and representatives of various bodies, technical and otherwise. Prominent at the high table were also Herr H. Prenger, the President of the Association and Manager of the gas, water, and electricity works of the City of Cologne, Dr. H. Bunte, the former Secretary of the Association, and now sole life or honorary member of the Council, and Herr F. Kördt, Vice-President, and Manager of the gas, water, and electricity works of Düsseldorf. After hunger and thirst had been well satisfied, the Burgomaster welcomed the Association to Dresden in the name of the city authorities. He referred to the fact that this was the fifth occasion on which the annual meeting had been held in Dresden, and that the numbers attending had now become so great that it was impossible for the reception to take place in the Rathaus. The increase was, however, in all other respects a source of great gratification to those concerned. Herr Prenger spoke in reply, and said it was always a special pleasure to the members of the Association to meet in so agreeable a town as Dresden, where they invariably received a hearty welcome. The toasts of the City of Dresden and of the Association were given and drunk in a hearty manner.

The sessions of the annual meeting opened on Tuesday, at 9 o'clock, in the large lecture hall of the Exhibition, Herr Prenger being in the chair, and supported by Professor H. Bunte, Dr. Karl Bunte, Herr Kördt, and the members of the Council of the Association. The Chairman having declared the meeting open, the Chief Burgomaster of Dresden, Geheimrat Dr. Beutler (who had been unable to attend the reception the previous evening), expressed the gratification of the city authorities at the visit of the Association. The visit was, he said, specially appropriate in the year of the Exhibition of Hygiene. The services rendered by water engineers in the improvement of hygienic conditions were so well known and recognized that it was needless to particularize them; but gas engineers also could claim to be performing equally great services in the same direction, by reason of their work in reducing the smoke and soot nuisance in large towns. The supply of gas over long distances was an urgent problem of the day, which promised as great benefits to the community as did the supply of electrical energy across country. In regard to water supply, it was a comparatively easy matter for large towns to tap a proper source, at a distance, of water suitable for drinking purposes. But the problem was a more difficult one for suburban districts and the more isolated industrial centres. It needed very serious attention. Naturally, it did not offer the prospects of profit which were presented by long-distance supplies of gas. Another reason why he welcomed heartily the gas engineers was that gas-works constituted a very important source of income to municipal authorities. In this respect, Herr Hasse, the Chairman of the Gas Committee, and Herr P. Göbel, the Manager of the Dresden Gas-Works, had done a great deal for the city, as doubtless had many of their colleagues, then present, for their own individual municipalities.

The President of the Association thanked Dr. Beutler for his words, and said that Dresden had played an important *rôle* in the history of the gas industry, in that it was the first Corporation to possess its own gas-works. Herr Joh. Körting, of Düsseldorf, next spoke on behalf of the Association of German Engineers (Civil and Mechanical), from whom he brought greetings, as did also Dr. Strache, of Vienna, from the Austro-Hungarian Association of Gas and Water Engineers. The greetings of the Technical Colleges of the Kingdom of Saxony were conveyed by Professor Mollier. The President expressed the thanks of the Association for all these greetings. He then went on to say that this year the Association had decided to nominate as an honorary member one who had done notable service to hygiene—viz., Sir William Lindley, of Frankfort-on-the-Main—for his work in the interests of water supply, and for his labours as Chairman of the Committee on the International Standardization of Pipe-Threads. Sir William Lindley, in expressing his thanks for the distinction which the Association had conferred on him, remarked that it was now 33 years since he first read a paper before it, and that was also at a meeting held in Dresden. He hoped to be preserved to work for the Association for some years more. The President next announced that the Association had conferred the Pettenkofer Medallion of Honour on Herr F. Reese, of Dortmund, in recognition of his labours in compiling the water statistics of the Association, and on Herr Reichard, of Carlsruhe, for his work in the campaign against the smoke and soot nuisance in towns. Herr Reese, in acknowledging the honour bestowed upon him, said that he had been a member of the Association for 38 years past.

The President's Address.

The President, Herr Prenger, then proceeded to deliver an inaugural address, in which he reviewed the year's progress in the gas and water industries—taking as his basis the annual report of the Council of the Association, of which a *résumé* is given on another page of the "Journal." Other points referred to, however, included a notice of the increase in the consumption of gas in Germany. The statistics compiled by the Association showed that there were made in the year 1909, 77,000 million cubic feet of gas, which was supplied to consumers representing 30,350,000 people. It was therefore apparent that at the present time one out of every two persons in Germany is a user of gas. The make of gas per head of the population was 2366 cubic feet. This, however, was far behind the corresponding figure for England. In Berlin, the increase in the number of gas consumers in one year alone was 28,455; while the total number of consumers supplied with electricity was only 30,946. Comparison of the prices paid for gas in different districts and countries showed that in general the charges prevailing in Germany were much too high. Gas must be cheaper. In order to attract the small consumer, the most economical apparatus for using gas for different purposes must be brought to his notice. It was a mistake which was in all probability still made by some gas undertakings to encourage the use of appliances which consumed a lot of gas in a manner which was to the disadvantage of the consumer. Gas continued to make new friends, though in some quarters there prevailed an impression to the contrary. Fresh discoveries and inventions were increasing its value day by day. A recent phase in the development of the gas industry was the supply of gas to distant places from large central gas-works. This method of supplying gas was the complement of the cross-country supply of electricity. Another great industrial development was that of the supply of gas at high pressure. There was no fear that an industry in which in Germany about £50,000,000 of capital was employed would be easily suppressed; but it must be remembered that to stand still was in reality to fall behind. The instances quoted, however, showed that the gas industry was not standing still, but was now advancing rapidly.

Two Papers on Coke.

The President, on the conclusion of his address, called upon Mr. E. Körting, the General Manager in Berlin of the Imperial Continental Gas Association, to read his paper upon "Gas Coke, from the Standpoints of the Commercial Man, the Accountant, and the Gas Engineer." An abstract translation of this paper is given elsewhere in to-day's "Journal." Broadly, the author advocated the supply by gas-works of the best and driest coke producible, while its advantages were brought before the public by suitable advertisement. This was a means by which one of the most active competitors with gas coke in Germany—viz., brown-coal briquettes—had achieved their present popularity. There was a very brief discussion on the paper; and then the President called upon Herr Göhrum, the Manager of the Stuttgart Gas-Works, to proceed with his communication on "Recent Methods of Quenching Coke." This took the form of a lecture, in which Herr Göhrum drew the attention of members to a number of tables, diagrams, and views of plant which were thrown on the screen in rapid succession. Some of the tables showed the different proportions of water contained in coke from different

classes of coal when carbonized in different types of retort, &c., when quenched by hand or otherwise; but the figures were too indistinct for reading. They showed, however, the ill-effects on coke of certain types of coke-handling and quenching plant. The lecturer considered that every effort should be made to produce coke of uniform quality on gas-works, whatever the type of coal and method of quenching employed. It was not merely a question for the engineer which type of plant and method of quenching enabled him best to deal with the large quantities of coke discharged at once from many modern types of carbonizing plant. The commercial interests represented by the coke consumer were of paramount importance; and it was essential that the coke should not contain an excessively high proportion of water. On the other hand, the ordinary coke user found perfectly dry coke troublesome in cases where he had been accustomed to coke containing a normal proportion of water. The views of coke-quenching shown ranged from the most primitive method of hand-quenching, by throwing water from a bucket over the heap of glowing coke, to the large automatic coke-quenching towers which are now being installed by Messrs. A. Bleichert and Co. in connection with settings of coal carbonizing chambers. Benches of horizontal, inclined, and vertical retorts, with various forms of conveying troughs, in which the coke is quenched, extending in front of the bench, were shown, some including the extension of the trough on an incline to the breaking and screening plant.

The Illig coke-stifling, as distinct from quenching, plant was shown; and the method of receiving the discharged coke in a large vessel or barrow, which is then lowered into a tank, as used for quenching the coke at the Stuttgart Gas-Works, was also referred to. The more difficult problem of handling the considerable quantity of glowing coke liberated on a large carbonizing chamber being discharged, has been dealt with provisionally in a number of ways; and the hydraulic coke-quenching cars, the longitudinal trough, and the quenching-towers which have been introduced *inter alia* at Hamburg and Tegel (Berlin) were shown. It may be mentioned that, in connection with some settings of vertical retorts, Mr. E. Körting has introduced an automatic quenching device, by which the liberated coke, as it travels along the De Brouwer trough-conveyor, strikes levers which open taps on a water supply to sprinklers immediately above the trough. This arrangement secures adequate quenching, and does not oversaturate the coke, while it avoids all waste of water.

In the discussion on Herr Göhrum's communication, Professor H. Bunte said that the question of the moisture in coke produced and quenched in different ways might most advantageously be investigated thoroughly by the staff of the Instructional and Experimental Works of the Association. Coke was such an important bye-product that its quality ought nowhere to be disregarded. Mr. Körting emphasized this view, and referred to some of the figures in his own paper, and Herr Göhrum then replied, thanking the speakers for their suggestions and comments.

High-Pressure Distribution to a Distance.

The next communication was a very long paper by Dr. E. Blum, the Managing-Director of the Berlin-Anhalt Engineering Company ("Bamag"), entitled "Long-Distance Gas-Mains: Their Use and Industrial Economy." The development of the long-distance transmission of gas under high-pressure from a central works is one of the most striking departures of the last decade in the gas industry in Germany. Quite recently it has been proceeding at a very rapid rate, and with most successful results. No doubt some of the small towns and outlying communities which have thus obtained a supply of gas would have otherwise been building independent gas-works; but, generally speaking, it may be said that the new system has reached a circle of people who would not otherwise have become gas consumers at all. A distinct gain to the industry at large has thus been achieved. In particular, the electricity supply undertakings which in the past have prospered through the cross country supply of current to outlying districts in Germany—by overhead high-tension conductors, which are not permitted under the Board of Trade regulations in this country—have met with a powerful check on their operations. Gas presents so many advantages over electricity, on account of its more varied uses and greater economy, that an outlying district which formerly would have arranged for a supply of current across country from a central electricity works, will now, for choice, obtain a supply of gas through a high-pressure main from the gas-works of the nearest town. Herr Blum's paper demonstrated ably and completely the greater economy of gas over electricity for a supply in such conditions, and especially in respect of capital expenditure. His paper evoked a lively discussion; there being one or two sponsors for electricity who demurred from his conclusions. But the latter were broadly supported by Herr Kordt, who is in charge of both the gas and the electricity departments of the Corporation of Düsseldorf.

The Experimental Works of the Association.

Professor H. Bunte next gave a short lecture on the work of the Instructional and Experimental Works of the Association. These works, it will be remembered, were established at Carlsruhe some few years ago by the German Association, partly from its ordinary accumulated funds and partly from special contributions; and reports have appeared from time to time in the pages of the "JOURNAL" showing the good work which has already been accomplished there under the general supervision of Professor Bunte. In his present lecture, the Professor sought to indicate how the work was being continued and extended, and to show ways in which the Institution could be of direct assistance to gas-works. A great deal of his lecture covered ground which is dealt with in the report of the Committee of the Association on the Instructional and Experimental Gas-Works, of which report an abstract-translation will be given in the "JOURNAL" with the reports of the other Technical Committees of the Association; and the lecture itself was curtailed owing to the reading and discussion of Herr Blum's paper having occupied an undue amount of time. Professor Bunte pointed out that the example of the German Association in establishing its Instructional and Experimental Gas-Works at Carlsruhe had been followed elsewhere—viz., by the English gas engineers at Leeds, by the Swiss at Zürich, and by the Austrians at Vienna. The chief question dealt with at Carlsruhe continued to be the exhaustive investigation of different descriptions of gas coal. In the past year, a relatively large number of samples of English coal had been examined; and though the use of English coal was mainly confined to the gas-works on or near the main waterways of Germany, it should be remembered that 25 to 30 per cent. of the coal carbonized in Germany was English. Exhaustive studies had now been made, however, of 80 different gas coals of various origins; but these only represented a small proportion of those which were on the market. It was hoped, however, that the laboratory would soon be in a position to settle the relative economy of the different kinds generally available. The coal substance proper was very similar in all coals. The fact that gas of high illuminating power was no longer required had greatly enlarged the number of coals available for gas manufacture, and new kinds had thus become applicable and had needed investigation. A gas-works required coal which was of constantly good quality for its purpose—the essentials being, in addition to a large yield of gas, that the coke should be good, and that the calorific power of the gas should not be below 5200 calories per cubic metre (about 545 B.Th.U. per cubic foot). The proportion of ash in the coal was also important as affecting the yield of gas and the quality of the coke. Gas-works had now frequently to guarantee to supply coke having at least a certain specified calorific power; and this condition might not be fulfilled if the coal employed contained much ash. Broadly speaking, the English coal imported into Germany contained 7 per cent. of ash, whereas Westphalian coal contained 10 per cent., and Saar coal 12 per cent. It was of primary importance to gas-works to control effectively the supplies of their raw material, and to see that the deliveries did not differ substantially, as was frequently the case. The second direction in which the Experimental Gas-Works had done good service was in controlling the working of the gas-works' plant through visits of inspection and investigation by its staff, and in carrying out efficiency trials of plant on the spot. In this way great assistance could be given, especially to smaller works, which had not chemists of their own. The investigations of the visiting staff could well be extended to the efficiency of the steam-engines, boilers, gas-engines, &c., in use on the gas-works. Other work undertaken at Carlsruhe was in regard to the vitiation of air by gas lighting and heating plant, and the demonstration of the fact that the products of combustion of gas were not injurious to health as were the products of breathing.

The President having thanked Professor Bunte for his lecture, adjourned the proceedings to the following day (Wednesday).

The Dresden Gas-Works.

Alternative visits to two works had been arranged for the afternoon. Those who elected to see the Corporation gas-works, situated at Reick, on the outskirts of the city, were conveyed thither in special tram-cars, and on their arrival were divided into groups which were conducted round the works by different members of the technical staff. The most striking feature of the works is a comparatively new gasholder, in four lifts, having a capacity of 120,000 cubic metres (nearly 4¼ million cubic feet). This gasholder, like the two smaller and older holders on the works, is enclosed in a house, and is doubtless one of the largest of such enclosed gasholders in the world. The house in this instance is a plain substantial structure, cement-rendered, and, except for a lantern crowning the dome roof, is without any æsthetic relief. It must be a matter of fairly evenly divided opinion whether such a structure is preferable in appearance to a well-designed independent gasholder; and it is not clear whether this and other recent examples of enclosed gasholders in Germany have been so erected by way of compliance with obsolete local enactments or in deference to the views of architectural authorities. The old view that it was necessary in places where there is heavy frost in winter time to enclose a gasholder in a house, in order to reduce the risk from freezing of the water in the seals, cannot now be seriously entertained in districts where the winter is not more severe than in Dresden or Berlin. In the latter city, the Corporation erect gasholders in outlying works, such as Tegel, inside houses; whereas in the similarly outlying Mariendorf works of the Imperial Continental Gas Association, the holders stand out in the open. The difference in this case cannot clearly be due to any difference in the regulations of a State or local authority. Again, in Leipzig there is a comparatively modern gasholder of considerable size enclosed in a house; but a new gasholder now in course of erection near by is to be in the open. Whatever may have been the reason for its construction on the enclosed pattern, however, the new Dresden gasholder is a fine, massive structure.

There was not a great deal of other plant of very recent date

or novelty on the works. The bulk of the carbonizing plant consisted of settings of inclined retorts. There was a trial setting, however, of large carbonizing chambers with inclined bottoms, constructed to the design of Herr Göbel, the Manager of the Dresden Gas-Works, which attracted considerable attention. One chamber was discharged in the presence of the visitors. There are two doors or mouthpieces on the upper end of the chamber, which is charged through the uppermost. The lower is opened if the block of coke does not discharge itself cleanly when the door which forms the bottom end of the chamber is opened. Each chamber receives a charge of about 3 tons of coal. The coke discharged seemed well worked off; and the heats in the setting were good. There was naturally, with this isolated trial setting, no special provision for quenching and disposing of the large quantity of coke liberated when a chamber is discharged.

The visitors, on leaving the works, were regaled with coffee and other light refreshments provided by the Gas Committee, and then returned to the city in special tram-cars.

The alternative visit on this afternoon was by steamboat to the sewage-clarifying and treatment works of Dresden, in the suburb of Kaditz. The sewage from the greater part (the Aldstadt, or old town) of Dresden, which lies on the opposite side of the River Elbe, is pumped through a large conduit beneath the river to this works, where it is clarified before discharge into the river.

The greater part of the members of the Association dined in small groups at the Exhibition, though a considerable number were to be seen in the more popular of the restaurants in other parts of the town.

Papers on Water Supply.

The second sitting for technical proceedings began at nine o'clock on Wednesday morning, with Herr Prenger again presiding. Six communications relating to water supply were read and discussed. The first was by Herr Herzberg, of Berlin, on "The Work of the Association for Water Supply and Sewage Disposal." He said the Association had been primarily instrumental in securing the establishment in Berlin of the Royal Experimental Institute for Water Supply and Sewage Disposal; and a Committee of fifteen members of the Association assisted in its management. The Association was supported by 61 large municipalities, of which the chief civic functionaries were among its members, as well as by the Association of German Engineers and the German Association of Gas and Water Engineers. The Association had between the years 1902-10 spent about £5300 on scientific investigations. After reference to work done at the Royal Institute and the published reports upon it, the speaker said that, the rooms of the Institute having proved too small for its work, the Prussian Government had this year set aside a sum of £30,000 for the erection of new laboratories, &c., for it at Daheim. A ministerial recommendation that local authorities should obtain the assistance of the Institute on questions concerning the construction and operation of water-works had, however, met with the opposition of the Association of German Engineers, the members of which believed that this implied competition of the Institute with practising civil engineers. The speaker, however, contended that the recommendation was only intended to apply to any small local authorities who had not the means to obtain a scheme for a proper water supply in the regular way.

The next communication was a very lengthy address or lecture delivered with great fluency by Dr. Gärtner, a Professor of Jena, on "The Present Position of the Question of Water Supply." After a lively discussion, in which Sir William Lindley joined, a paper was read by Herr F. Scheelhaase, of Frankfort-on-the-Maine, on "The Production of Artificial Underground Water from River Water." This paper also evoked a lively discussion. The next paper was by Herr R. Schroeder, of Hamburg, on "Modern Pumping-Engines for Water-Works." It was to have been followed by communications "On the Sterilization of Drinking Water by Ultra-Violet Rays," by Professor J. Courmont, of Lyons (of which a translation from the French original was laid before the meeting), and "On the Action of Ultra-Violet Rays on Bacteria," by Professor O. Bujwid, of Cracow; but the reading of these was postponed to the following morning.

The sitting concluded with the presentation by its Chairman—Herr Reese, of Dortmund—of the report of the Committee of the Association on "The Working of Water-Works." This report will be briefly dealt with along with the summaries of the reports of the other Technical Committees of the Association. Abstracts of the communications by Dr. Gärtner, Professor Scheelhaase, Professor J. Courmont, and Professor Bujwid, all of which excited exceptional interest at the meeting, will be given in an early issue of the "JOURNAL."

Excursions.

In the afternoon, two alternative visits to works had been arranged, each followed by a steamboat excursion on the Elbe. One party—and that the larger—were conveyed up-stream, in two of the "luxus" steamers of the Saxony-Bohemia Steamboat Company, as far as Königstein, in the so-called Saxon Switzerland. The steamers stopped *en route* for those who had previously gone by tramcar to the water-works of the Corporation at Hosterwitz, which is on the Elbe a short distance above Dresden. Owing to the late conclusion of the morning's proceedings, however, comparatively few members had time to interpose the visit to the water-works. Supper and refreshments were served on the steamers; and the return journey from Königstein was made with illumination of the river banks at intervals, and salutes of guns and fireworks. Dresden was reached again about midnight. The other party were conveyed in a similar steamer down-stream to Meissen, where the Royal Porcelain Works are situated. Those who left the morning's proceedings in time paid a visit to the iron-works of the firm of Meurer, at Cossebaude, which was reached by special train; and the steamer for Meissen was joined at Gohlis, near by. The party returned to Dresden from Meissen by special train.

Distant Ignition of Street-Lamps.

The third, and last, sitting opened on Thursday morning, when the papers on the action of ultra-violet rays on water already mentioned were first taken—Professor Courmont being prevented by illness from presenting his in person. Then the remaining papers on gas were dealt with. Two of them related to the distance lighting of street gas-lamps. The first of these, by Herr Metzger, of Bromberg, detailed his experiences with pressure-wave distance lighters at the Bromberg Gas-Works, which supplies a district of somewhat unusually wide area relatively to the size of the town, which has a population of about 80,000. He had used concurrently both the "Bamag" and "Meteor" distance lighting apparatus, and could not give a decided preference to either. The system effected very considerable economies, and on the whole had given satisfaction, though there were some attendant disadvantages. It was intended, however, to extend it shortly to the whole of the street-lamps in Bromberg, to the number of about 1500. The other paper on the same subject was by Herr Kobbert, the Manager of the Königsberg Gas-Works. He had used the same two types of distant lighting apparatus as Herr Metzger; and while both had behaved well, the "Meteor" possessed certain advantages. These two papers, which are full of details of the installations and their working results, will be given in abstract in a subsequent issue of the "JOURNAL."

The Use of Tar in Diesel Engines.

The next communication was a paper by Dr. W. Allner, of Dessau, on "The Use of Tar for Driving Diesel Engines." This referred to the relative advantages in German conditions of petroleum or shale oil and tar as a fuel for engines of the Diesel type. The properties of coal tar derived from different coals under different carbonizing conditions were dealt with very fully; and, in this respect, the paper will prove useful also to those who are not directly concerned with tar as a fuel for Diesel engines. An abstract of the contents of this valuable paper is already in preparation.

Reports of the Technical Committees.

Then followed the presentation of the reports of the several Technical Committees of the Association by their respective Chairmen—viz., on the "Instructional and Experimental Gas-Works," by Dr. Karl Bunte, of Carlsruhe; "Photometry," by Dr. W. Leybold, of Hamburg; "Heating," by Dr. E. Schilling, of Munich; "Gas-Meters," by Herr C. Kohn, of Frankfort-on-the-Maine; "Gasholder Standardization," by Herr Niemann, of Dessau; "Electrolysis," by Sir William Lindley, of Frankfort-on-the-Maine; "Technical Instruction," by Herr W. von Oechelhaeuser, of Dessau; "Standard Screw-Threads," by Sir William Lindley; and the "Working of Gas-Works," by Herr Prenger, of Cologne. Abstracts of these reports will be given in an early issue.

Report and Private Business.

The report of the Council for the year was presented by the President. A summary of its contents is given on another page of this number. The accounts, including those of the Schiele Foundation and the Benevolent Fund of the Association, were next dealt with; and the meeting proceeded to the election of officers to take the place of those who retired and were not eligible for re-election. Herr Prenger, of Cologne, is succeeded as President of the Association by Herr F. Kordt, the Manager of the Corporation gas, water, and electricity works at Düsseldorf. It was decided to hold next year's general meeting at Munich. The members of the various Technical Committees for the ensuing year were also appointed. The sitting closed at a late hour in the afternoon.

The Banquet.

The banquet took place on Thursday evening, and was attended by over 1200 members and guests, who were seated at fourteen long tables and a high table in the large banqueting hall of the Exhibition. The time fixed was the comparatively early hour—to English ideas—of six o'clock. The first toast—that of the "Emperor of Germany and the King of Saxony" jointly—was given by Herr Prenger, who was in the chair. Herr Kordt, of Düsseldorf, the President-Elect, next proposed the toast of the "Inhabitants and Authorities of Dresden," who had received the Association so hospitably. It was acknowledged by Councillor Dr. Körner, who, in turn, proposed success to the "German Association of Gas and Water Engineers." Herr F. Reese, of Dortmund, next gave the toast of the "Local Festivities Committee," which was replied to by Herr Wahl, of Dresden, who then proceeded to give the toast of "The Ladies." These toasts were, according to German custom, interposed while the banquet was being served. Owing to the number of those assembled, and the large size and apparently bad acoustic properties of the hall, the speeches were followed by very few of those present. The toasts were nevertheless received with the customary enthusiasm. As soon as the

banquet was finished (about ten o'clock), a move was made to the adjacent concert hall, which had been prepared as a ball room, and here dancing continued until long after midnight.

Concluding Visits.

Commonly, the Friday of the week of the annual meeting is devoted to one whole-day excursion; but last Friday members had three alternatives offered them. The first was a visit to the Exhibition—for anything approaching a thorough inspection of which there had been no time on the previous days. The second was an excursion to Klingenberg-Colmnitz, and a visit to the valley where new water-works for Dresden are in course of construction. The third was a visit to the works of the well-known firm of Adolf Bleichert and Co. at Gohlis, a suburb of Leipzig. In this visit, between 30 and 40 members participated. Some particulars of the works, where 800 men are now employed, will be given subsequently. The close of the meeting, owing to the divergent schemes for the last day, was therefore a breaking-up of small parties; and members returned home at various times and from different points on Friday and Saturday. The weather was fairly good for most of the outdoor functions connected with the meeting, although on the Tuesday morning the downpour of rain was so heavy and continuous that the noise made by it seriously interfered with the hearing of the speeches, and the roof of the temporary lecture hall of the exhibition-type proved incapable of resisting penetration—even immediately above the Presidential chair. In other respects, however, the sittings have never been held more comfortably.

REPORT OF THE COUNCIL FOR THE YEAR 1910-11.

The following is a summary of the report which was presented at the meeting of the Association in Dresden last week.

The most important event in the year was the visit of eighty members of the Association to England as the guests of the Institution of Gas Engineers. The heartiest thanks of the Association are accorded to the Institution for the memorable hospitality which it dispensed on that occasion, and special thanks are given to Mr. Alexander Wilson and Mr. J. W. Helps, last and this year's Presidents of the Institution. There are also named, with gratitude, for the facilities given for the inspection of works and their cordial reception, the Gaslight and Coke Company and Mr. Corbet Woodall, the South Metropolitan Gas Company and Mr. Charles Carpenter, the Croydon Gas Company and Mr. J. W. Helps, the Edinburgh and Leith Corporations and Mr. W. R. Herring, and the Glasgow Corporation and Mr. Alexander Wilson. As a token of its gratitude and a memento of the visit, the Association is presenting to the Institution an artistically executed Chairman's hammer and block.

Another international function, which is recorded with pleasure, was a visit in May last to the Berlin, Hamburg, and other water-works in Germany of a number of Russian water engineers. In several Commissions also the Association has co-operated with the technical men of other countries. In the autumn of last year, the International Standard Screw-Threads Commission held a session in Paris, at which Sir William Lindley, on behalf of the Association and a number of other technical Institutions of Germany, and with the approval of those of England, Belgium, Switzerland, and Austria, brought forward the standard Whitworth threads which he had carefully prepared as suitable to displace the metric screw-threads which are still adopted in America and France. Though a final settlement has not yet been reached, the hope is expressed that a way has been found by which the metric threads, which are useless and inconvenient for European conditions, may be displaced by the more practical and more generally acceptable Whitworth threads.

The International Photometric Committee is to hold a session this month (July). Germany, as already reported, is content for the present to endeavour to settle the ratio subsisting between its own practical unit of light—the Hefner—and the international candle which has been mainly fixed from calculations. The technical Associations represented by the German members of the International Committee have obtained the assent of the Ministry of the Interior to a petition asking that the Imperial Physical-Technical Institute ("Reichsanstalt") shall set about the production of a unit of light which will be free from practical as well as theoretical objections. Other representations made by the Association to the State authorities were not, however, equally favourably received. Infractions on the part of the police authorities of Berlin of the ordinance made in November, 1907, by which gas and electricity were placed on equal terms in regard to the lighting of warehouses, having been reported—in some cases the removal of existing gas installations had been required—the attention of the Ministers of State was drawn by petition to the circumstance; but their answer was to the effect that, in the cases cited, the police authorities were at liberty to exercise their own particular judgment, and to decide accordingly. A petition to the President of Police in Berlin was thereupon presented jointly by this Association and the Association of German Electricians, in regard to certain prohibitions which he had made respecting the lighting of shop show windows and illuminated signs. As a result, the prohibitions were either withdrawn or suitably modified. A petition made by the Association to the Minister of the Interior in regard to a projected law respecting the transmission of high-tension electric currents, has not yet been answered. The proposals for a new law regarding standardization drew attention to the disproportionately high fees for the testing and stamping of gas-meters, and a petition to the Bundesrat (Lower House) has been drawn up asking for a reduction of the fees. It is computed from the accounts of the standards office that the cost of testing and stamping would be covered by a fee of about 4d. per meter. Sufficient time has not yet elapsed for this petition to have been dealt with.

The Association has, jointly with the Industrial Union of German Gas-Works and the Organization for Promoting the Sale of Gas, raised a protest against an instruction of the Minister of Commerce and Industry, to the effect that oven coke should be used for the central heating plants in the hands of the State. The instruction contains a very unsatisfactory statement of the value of gas coke as compared with oven coke, and it is eminently desirable that it should not gain publicity. The last general meeting of the Association approved of two comprehensive statements being issued—one relating to the "Standard Conditions for Return Electric Currents," which was prepared by the Electrolysis Committee in co-operation with other technical bodies; and the other to the "Rules for the Installation of Gas" in relation to its sale and use. A number of prominent members of the Electrolysis Committee have since then issued a set of explanations of the Standard Conditions or "Rules for the Protection of Gas and Water Pipes from the injurious action of the current of continuous current electric tramways in which the rails are used as conductors." The rules have so far not raised any opposition, and tests made by the Electrolysis Committee on installations conforming with them have fully confirmed their appropriateness. The Installation Rules have been adopted in particular towns, and a reprint of them has had a sale of 1700 copies. The Association is at the present time engaged in the preparation of "Rules for the Installation of Water Supplies in Houses." The affiliated Associations are being consulted in regard to these rules; and it is hoped that they may be ready for presentation for approval at next year's general meeting. The Association has to thank Sir William Lindley for his activity in this matter.

The Association has furnished various exhibits in the scientific section of the International Hygiene Exhibition at Dresden this year. Unfortunately, a comprehensive representation of the gas industry, which it was at one time intended that the Association should make, in conjunction with the Central Organization for Promoting the Sale of Gas, was not ultimately arranged. The negotiations with the Exhibition authorities were conducted by the Central Organization, and that body failed to come to agreement with them. The result does not indicate that the Association was not keenly interested in the fruition of the scheme. It is hoped that a comprehensive presentation of the manifold applications of gas in the household and in industry will be arranged for the projected exhibition next year in Berlin relating to "Woman at Home and in a Vocation." The Association has also promised its support to the Book Trades Exhibition at Leipzig in 1913. By these means, it hopes to supplement the good work which the Central Organization has accomplished during the past year (which is the first year of its existence) in the direction of demonstrating the new methods in which gas may be applied with economy and convenience, and of proving that it is by no means old-fashioned. Much may be done in the same direction also through the Committee, which was first appointed at last year's general meeting, on the "Working of Gas-Works. One of the first matters for this Committee is to demonstrate from statistics the progress made by the whole gas industry apart from that of isolated members of it. The Committee have also to provide a uniform scheme of book-keeping for gas-works, without which it is impossible to make an exhaustive comparison of the economical results of different methods of working. While the Committee are only on the threshold of this work, the Instructional Committee will inform this year's meeting that their purpose has now been fulfilled. It has organized the training of gas engineers. The gas foremen's and fitters' schools have demonstrated, in the last few years, that their work is being conducted on successful lines, and will now go on automatically. It is proposed to dissolve this Committee, to which the Association is much indebted for the work accomplished.

In regard to other Technical Committees, the report of that on the Instructional and Experimental Works of the Association shows that the work is developing successfully. The Heating Committee have settled a number of important matters—such as the standardization of gas heating-stoves, the preparation of a memorial on the use of gas coke for central heating plants, and the rules relating to the installation of gas supplies in houses, already referred to. There are no similar matters imminent; and this Committee therefore proposes that it should be dissolved until such time as important questions may again arise with which it can deal. The Gas-Meter Committee, on the other hand, is engaged in work which will occupy them well for a further term. They are dealing with the testing of dry meters, the standardization of meter unions, oil-gas meters, and the trustworthiness of gas-meters under high pressures. A new matter which has been referred to the Committees on the Working of Gas and Water Works is the study of the movement of mains in the soil.

The thirty-first volume of the gas statistics compiled by the Association relates to the year 1909 (or 1909-10) and 296 works or undertakings, as against 287 in the preceding volume. A general increase in the quantity of gas made is shown, though the increase falls somewhat short of that shown the preceding year. Of the

works appearing in the two consecutive years' reports, 125 show an increase not exceeding 5 per cent., 65 between 5 and 10 per cent., and 19 from 10 to 28 per cent. Forty-one works have had a decrease, though in only three cases does it exceed 5 per cent.; and in 37 works there has been practically no change in the make of gas. An attempt, foreshadowed in last year's report, to prepare more detailed statistics, for publication to members at intervals of five years, has not been attended with success in the first instance, because the figures supplied from different works clearly rested on different bases, and it would have been misleading to have taken them for comparative purposes. It is hoped in later years, when perhaps methods of administration and of book-keeping have become unified for gas undertakings, that it will be possible to prepare detailed statistics for comparison of the working of German gas undertakings.

The number of members of all classes has increased by 27 during the year, and now is 1134, of which four are honorary members, 217 associates, and the remainder ordinary members. Ten members were lost through death during the year.

The reports sent in by eight affiliated District Associations are next quoted in full. The Mark (Brandenburg) Association of Gas, Water, and Electrical Engineers held its thirty-second annual meeting in Berlin in April last under the chairmanship of Herr Pfudel. The meeting extended over three days, and several interesting papers were read. The Mid-Rhenish Gas and Water Engineers' Association held its forty-seventh annual meeting at Gmünd (in Swabia) in September last, under the chairmanship of Herr Frahm, of Baden-Baden. The membership numbers 271. The Association of Gas and Water Engineers of Silesia and Lausitz held its forty-second annual meeting at Zabrze in August last, under the chairmanship of Herr Goerisch, of Schweidnitz. It has 163 members. The Association of Gas, Electrical, and Water Engineers of the Rhine District and Westphalia held two meetings—one at Trèves in September, and one in January last. The Association numbered at the close of the year 371 members of all classes. The Bavarian Association of Gas and Water Engineers held its twenty-sixth annual meeting at Coburg in May, under the chairmanship of Herr Terhaerst, the Manager of the Nuremberg Gas-Works. This Association has a membership of 171. The Baltic Association of Gas and Water Engineers suffered the loss during the year of its Chairman, Herr Gellendien, of Elbing. It held its thirty-eighth annual meeting at Königsberg on June 20, 1910. It comprises 163 members. The Association of Gas and Water Engineers of Saxony and Thuringia held its fifty-eighth annual general meeting during May last at Leipzig, under the chairmanship of Herr Martin, Manager of the Erfurt Gas-Works. The number of members of this Association is now 183. The Lower Saxony Association of Gas and Water Engineers held its twelfth annual meeting in September last at Flensburg; Herr Hase, the Manager of the Lübeck Gas-Works, being in the chair. This, the youngest of the District Associations, has a membership of 161. At all the meetings mentioned numerous technical papers were read and discussed, and usually a visit to works concluded the proceedings.

The report of the parent Association next gives a list of the contributors to its special fund for scientific purposes, and states the present position of the Schiele foundation, from which grants are made from time to time to enable selected students to make tours of study. The Committee charged with the administration of the funds of this foundation appeal this year for subscriptions to supplement them. The Benevolent Fund of the Association received contributions to the amount of about £300 in the course of the year; and distributed to 32 cases about £488. The capital of the fund is invested to the amount of about £5350.

The President and three members of the Advisory Committee of the Association retire from office, and are not eligible for re-election this year. The report is signed by Herr H. Prenger, as President, and Herr F. Kordt, of Düsseldorf, and Herr H. Ries, of Munich, as Vice-Presidents, and countersigned by Dr. Karl Bunte, the General Secretary of the Association.

Presentation to Mr. and Mrs. W. E. Price.—An interesting ceremony took place at the works of the Hampton Court Gas Company last Tuesday, when a presentation was made to Mr. W. E. Price, the Engineer and Manager, and Mrs. Price, on the occasion of their silver wedding. It took the form of a silver salver suitably engraved, which had been subscribed for by the whole of the staff and employees. The works were tastefully decorated for the occasion, and upwards of a hundred of the officials and men were present to congratulate the recipients. Mr. W. C. Lamb, the Secretary of the Company, who presided, said that when it became known that Mr. and Mrs. Price were about to complete 25 years of married life, a few of the staff took the matter into consideration, and he was proud to say the whole of them and the employees signified their assent to become associated in the movement. Mr. C. Douglas, the foreman, and the oldest employee of the Company (having been with them nearly sixty years), made the presentation; the salver being accompanied by an album containing the signatures of the subscribers. Mr. Price expressed his heartfelt thanks to all who had so thoughtfully remembered the occasion. He remarked that he was the second generation who had occupied the post of Engineer and Manager to the Company; his father, who was still in good health, having filled the position from 1851 to 1887. Mrs. Price also suitably responded.

CARBURETTED WATER GAS STATISTICS.

M. Ph. Delahaye has long been interested in the compilation of statistics relating to the gas industry, and in particular of those concerning the production of carburetted water gas. In 1905, he presented a collection of such figures to the Société Technique du Gaz en France; and they were referred to in the "Journal" at the time [Vol. XC., p. 953]. To this year's meeting of the Society he communicated another valuable compilation, which serves as a supplement to the previous one.

His tables are made up from official sources, both from England and the United States; and they have, therefore, already been available to, and noticed by, those interested in the subject. In France it is a very different matter; for there, carburetted water gas is practically prohibited and prohibitive; and discussions frequently occur among medical and other societies as to the hygienic and other aspects of such gas. The clear and concise tabulated facts and figures given by M. Delahaye are, therefore, of great use and value to those having to combat erroneous and prejudiced views. His recent paper covers some thirty pages. We give here but the briefest outline of it—referring readers to the paper itself for the full figures and details.

The author divides his matter into five departments, considering: 1. The units of material used in the manufacture of carburetted water gas. 2. The increase of consumption in the United States and England. 3. The effect of carburetted water gas on the gas industry. 4. Accidents during 1906-10 in the State of Massachusetts, due to coal gas, mixed gas, and blue gas. 5. General observations on the causes of anæmia of town dwellers.

Under the first heading, figures are taken from the paper read by Mr. W. R. Herring before the International Congress held at Glasgow in 1901, and from the working results of the water-gas plant at the Geneva Gas-Works. [M. Des Gouttes' paper dealing with this was given in the "Journal" for June 20, p. 927.]

To show the increase in the consumption of the two gases in the United States, the following (among other) figures are given:—

	1905. Cubic Metres.	Per Cent.	1907. Cubic Metres.	Per Cent.
Coal gas	1,132,718,023	34·3	1,534,951,175	36·7
Water gas	2,167,536,688	65·6	2,649,769,156	63·3
Total	3,300,254,711	99·9	4,184,720,331	100·0

The increase in the consumption of coal gas is, it is said, largely due to the utilization of gas from coke-ovens.

A great number of figures are given in regard to the gas production in Great Britain from 1900 up to 1909, from which the following results may be quoted:—

	1900. Cubic Feet.	1909. Cubic Feet.	Increase.
Coal gas	139,899,350,000	169,922,206,000	21 per cent.
Water gas	12,108,451,000	23,625,188,000	95 ,, ,,

Upon the third point—as to the effect of carburetted water gas upon gas production generally—the author observes that its development in England during the last ten years, together with the unanimity regarding it among European gas engineers, is sufficient proof of its usefulness and advantages. But not to rely merely upon a general proposition, he takes the English gas figures of 1909, and by calculation, ascertains the effect of the 23,625,188,000 cubic feet of water gas produced in that year. His conclusions are that the use of carburetted water gas resulted: (1) In diminishing by 12 per cent. the amount of coal to be bought; and (2) in reducing by 14 per cent. the quantity of coke to be sold.

Five tables taken from the official annual reports of Massachusetts, U.S.A., are given in the paper, recording the number of accidents due to gas in various forms. The figures cover about two millions of people and fifty-two towns during four consecutive years. The only legitimate conclusion to be drawn from them, the author remarks, is that the exploitation of gas is accompanied by neither more nor fewer accidents than any other kind of industrial undertaking. The following figures may be excerpted for the year 1909 in regard to mixed gas:—

Gas sold	238,827,820 cubic metres
Total number of accidents	39
Accidents per 100,000 inhabitants	2·38
,, ,, million cubic metres.	0·163

The corresponding figures for carburetted water gas are:

Gas sold	19,008,080 cubic metres
Total number of accidents	1
Accidents per 100,000 inhabitants	0·60
,, ,, million cubic metres.	0·05

Lastly, the corresponding figures for coal gas are:

Gas sold	12,611,480 cubic metres
Total number of accidents	3
Accidents per 100,000 inhabitants	1·78
,, ,, million cubic metres.	0·23

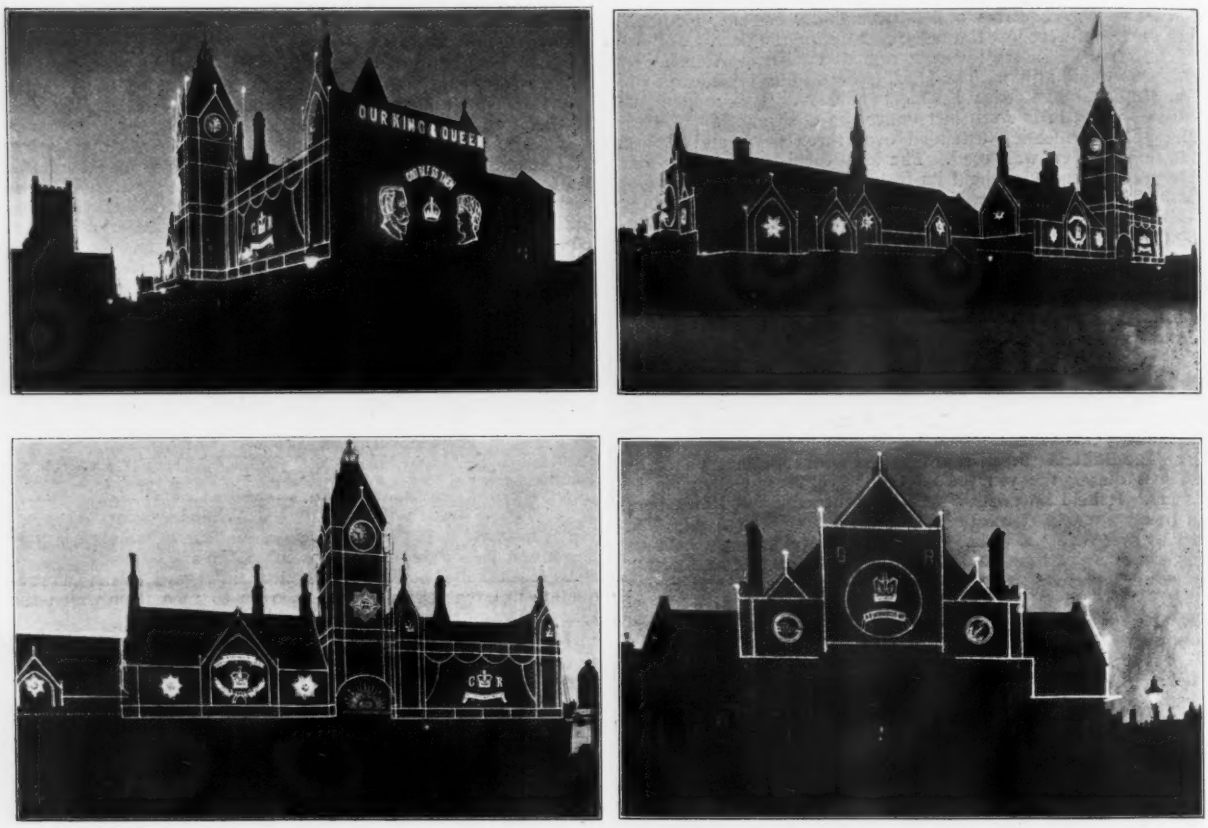
Under the fifth, and last, heading the author quotes from a paper by M. Albert Lévy presented to the Société des Ingénieurs Civils in January, 1907, to show the variety of causes of atmospheric pollution, and the anæmic condition of people that may be consequent upon it. Among these causes are processes of combustion and human respiration, which latter may itself result in producing toxicity of the air. Academic treatises seize on the production of carbon monoxide, among the poisons known and unknown, and frequently contain arguments of a fallacious kind, attributing to one source what may be really due to many others.

A PROVINCIAL GAS ILLUMINATION SCHEME.

What was Done at Burton-on-Trent.

In connection with the Coronation festivities, an extensive scheme of gas illumination was carried out at the Burton-on-Trent Town Hall, particulars of which (together with some photographs taken last Tuesday night) have been sent to us by Mr. R. S. Ramsden, the Assistant Gas Manager, under whose supervision the work was done. The excellent effect which was produced will be seen from the illustrations.

The building, it may be remarked, is about 240 feet long, 70 feet wide, and 45 feet high to the roof, with a tower some 85 feet high; one side, one end, and part of the other end being seen from the roadway. The scheme consisted in outlining the main features of the building with ¾-inch wrought-iron tubing, fitted with star-jet burners at 4-inch centres. About 50 gross of 10-hole burners, and about 6 gross of 6-hole burners, were used. Arranged in the panels of the outlining were about a score of pierced copper tube devices, in the form of stars, crowns, mottoes, and heads of the King and Queen; while over the main entrance was a fine coloured crystal device with loyal greetings, surrounding a semi-circular piece of white opal glass, on which were painted the borough arms—the whole being lit up from the back by naked gas-jets. With the exception of two brackets for carrying this crystal device, neither the brickwork nor the stonework of the Town Hall was interfered with. On a part of the building rather lower than the rest, gaslit fairy lamps (red, white, and blue) were employed; and on the gable end, among other devices, were the letters



THE GAS ILLUMINATIONS ROUND THE MUNICIPAL BUILDINGS AT BURTON-UPON-TRENT.

"G.R." formed by the Hersey or Hella "Bushlight" indestructible mantles, mounted on a frame of wrought-iron piping.

A 9-inch gas-main passes the Town Hall; and from this the following services were taken to supply the outlining and devices: An 8-inch service, with fourteen 2-inch and one 1½-inch branches. A 6-inch service, with three 2-inch and twelve 1½-inch branches. A 6-inch service, with one 2½-inch, three 2-inch, and four 1½-inch branches. A 3-inch service, with 2-inch and 1½-inch branches. Each branch had a full-way tap on it. Even with services of this capacity, the pressure was reduced from 30-10ths to about 7-10ths when all the lights were on. Mr. Ramsden estimates the consumption of gas at about 60,000 cubic feet per hour.

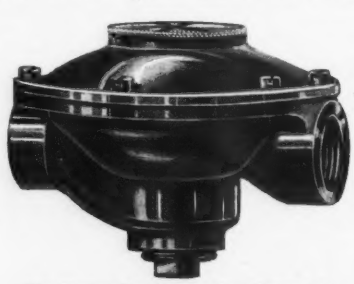
On Coronation day itself, less gas was sent out than on the Thursday of the preceding week; while the Friday's consumption showed an increase, owing to the illuminations being on for a longer time, and to gas being used for business purposes at the same time.

After experiencing a strong wind on the Thursday night, and drenching rain on the Saturday night, Mr. Ramsden says it seems that the ten-hole star-jet burners keep alight in the wind much better than devices of pierced copper tube. Brass burners appear to light up better in the wet than steatite ones, besides being cheaper and giving just as pretty an effect. The crystal device over the main entrance was bought in 1897, and has been altered and brought up to date for each festive occasion since. This is the first time that star-jet outlining has been used in conjunction with it; and the latter certainly makes it look paler by comparison than it used to seem when it shone alone in its glory.

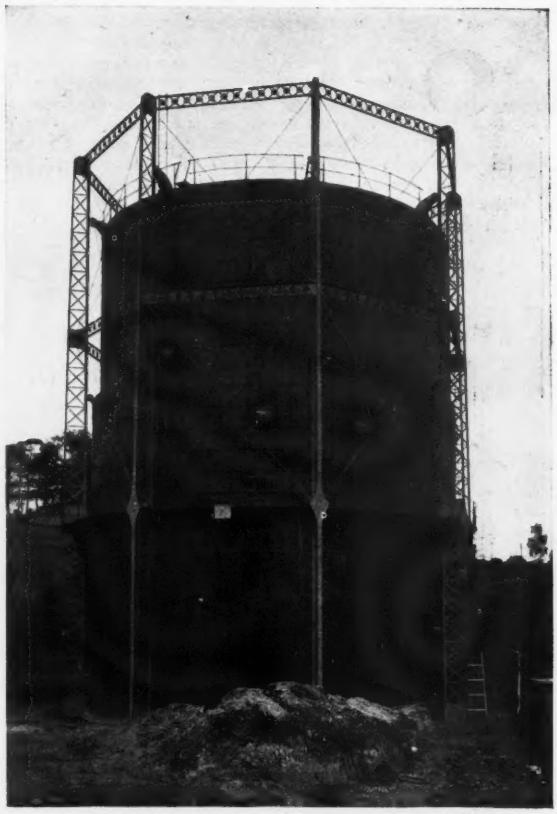
THE FOSTER DIAPHRAGM GAS-GOVERNOR.

For the purpose of automatically regulating the supply so that only gas at correct pressure is delivered, the Foster diaphragm type gas-governor has been introduced by the Foster Engineering Company, Limited, of Morden Road, Wimbledon. The simple design is the result of much careful experiment, and has proved to be efficient and reliable. Its small size permits of the governor being fixed in the most confined spaces; but accurate working demands that it be in an upright position.

In pointing out that the governor was designed to regulate within close limits under a wide variation in pressure and a constantly changing consumption, the makers say that these limits are exceptional they think will be agreed when it is stated that the inlet pressure varied from 4 inches to 90 inches of water—the consumption ranging from that of a small burner to full output at low pressure. To secure accurate regulation, they found it necessary to adopt balanced valves controlled by leather diaphragms. The balanced diaphragm type, it is claimed, proves invaluable where extra high pressure is in vogue. It maintains a very level pressure to the service, even though the primary pressure heavily fluctuates. It has also the advantage of being equally serviceable at all pressures, so that it can be used with existing low-pressure systems contemplating increases, as no alteration whatever is required to the governor should any change be made in the pressure. The governor is being used in connection with the high-pressure system at the Crystal Palace Festival of Empire, where it is understood that it is giving every satisfaction.



The Foster Diaphragm Gas-Governor.



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fixed in 1860.
IN CONTINUOUS USE
FOR 51 YEARS
WITHOUT BEING REPAIRED.

10 Light Meter
fixed in 1861.
IN CONTINUOUS USE
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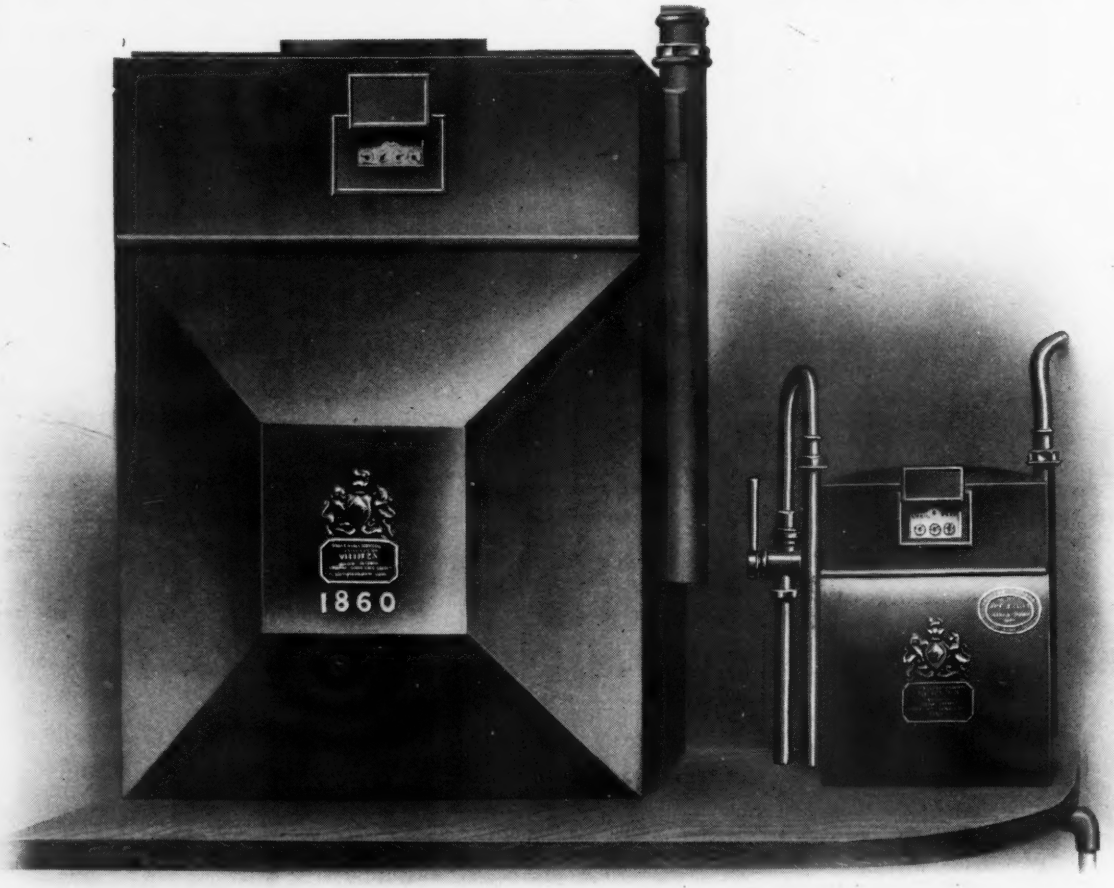

¶ These Meters have been in regular use since they were first fixed (51 and 50 years ago respectively).

¶ They have been periodically tested and found to be perfectly correct in registration.

¶ They have never been removed for repairs of any description and are still giving satisfaction.

¶ These are facts that speak volumes for the design of the "THOMAS GLOVER" METER and for the quality of the material and workmanship used.

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13, Whitworth Street West, MANCHESTER; 333, Queen Street, MELBOURNE;
8, Exchange Place, Donegall Street, BELFAST; and 12, Cunningham Lane, Pitt Street, SYDNEY.

THE INVENTION, DEVELOPMENT, AND PRESENT POSITION OF THE DESSAU VERTICAL RETORT.

[COMMUNICATED.]

IV.

THE first, second, and third articles of this series [see Vol. CXIII., pp. 150, 292, 519] brought the story of the invention, development, and progress of the Dessau vertical retort system up to the spring of 1908. The broad conclusion reached at the close of the third article was that extended trials on a working scale of 4 and 5 metre vertical retorts showed an average make of about 13,340 cubic feet of gas per ton of coal, which gas had a gross calorific power averaging 557 B.Th.U. per cubic foot.

The pronounced success of the Dessau vertical retort system, which had been achieved before the close of the year 1907, resulted in numerous attempts being made to devise systems which should compete with it in regard to the results obtainable. Some of these systems were unblushing imitations, and the more vigorous of them were suppressed by actions for infringement being instituted by the Dessau Vertical Gas-Retort Company in the Patent Courts of Germany and Austria. The grounds on which the decisions of the Courts were based will be referred to in a subsequent article. Apart, however, from the vertical retort plants which differed in no essential respect from that invented by Dr. Bueb, there were coming into being a class of vertical retorts worked on a somewhat different system, though for the most part embodying some of the features which were inherent to the Dessau vertical retort. These systems differed from the Dessau in that the vertical retorts were not charged and discharged intermittently, but coal was passed into, and coke withdrawn from, them more or less continuously.

CONTINUOUS VERTICAL RETORTS.

The problem of the continuous carbonization of coal has always been an attractive one to inventors; but the difficulties of obtaining sound joints between the carbonizer and the feeding and discharging devices, and of obtaining coke of good quality, proved insurmountable to all the earlier inventors, and have only lately been in some measure met. A truly continuous system of carbonization, in which the material undergoing carbonization is always moving forwards, however slowly, is almost certainly doomed to lead to the production of a small and friable coke, especially when the cross section of the vessel through which the material is passing increases from the anterior to the posterior end. Real consolidation of the coking material is then out of the question. A bond between the particles is no sooner made than it is broken by the movement of the material. The trouble arising from this cause has been lessened by the adoption of a semi-continuous method of working, by which the coking material is allowed to rest for a short time undisturbed, so that it may to a certain extent become consolidated before it is pushed forward and rubbed against adjacent portions of itself and the sides of the retort. Disintegration of the coke is thereby reduced; but the firmness of the coke made by the intermittent system followed in ordinary gas-retorts, in coke-ovens, and more particularly in the Dessau vertical retort, cannot possibly be secured by any system of continuous or semi-continuous carbonization. The coke produced in continuous carbonizers may, with certain grades of coal, approach more nearly in quality than with others to that produced in retorts and ovens charged intermittently; but it can never be quite so good.

The coke, moreover, in some, at least, of the continuous or semi-continuous systems, is further deteriorated by the excessive quantity of water which it acquires from the water-seal with which the lower mouthpiece or coke receiver is provided. The coke thus produced commonly contains from 10 to 12 per cent. of moisture, as independent published analyses testify. This being so, it is immaterial to the question of the quality of the coke to discuss whether more or less water is used in quenching it. Even when quenching is nominally dispensed with altogether, coke containing upwards of 12 per cent. of water results*—proof positive that its character is such that it is greedy of water, and will obtain it even when a free supply is withheld. Coke with such phenomenal absorptive power for water is obviously not of the firm, non-friable, impervious description which is desirable. What proportion of water would it contain if it were quenched in the ordinary way, or stored in the open in wet weather?

Passing on to the relative merits as gas-making plant of the continuous or semi-continuous systems and of the intermittent or Dessau system of vertical retorts, it may be useful to quote published figures for a representative type of the former, and compare them with those already substantiated for Dessau vertical retorts. The comparison is made on the basis of the corrected make of gas per ton of coal and of the gross calorific power of the gas. The figures given in Table IV. refer to trials of different descriptions of coal in the installation of Glover-West vertical retorts (continuous or semi-continuous) at the St. Helens Gas-Works. They are in all cases vouched for by Dr. Harold G. Colman; and the references to the pages of the "JOURNAL" from which they are quoted are given.

It will be seen that in these special trials of coals containing, on an average, the low proportion of 4·93 per cent. of ash, the make of gas per ton of coal was 12,283 cubic feet, as compared with the 13,341 cubic feet per ton achieved in installations of Dessau vertical retorts. Those who dislike the conclusion to which this comparison obviously leads may perhaps allege that it is unfair because the Dessau retorts have been worked with steaming, and the volume of gas made includes not merely the coal gas resulting from the carbonization of the coal, but also a proportion of water gas produced from the steam. The objection would be material were the quality of the gas made on the Dessau system much lower than that of the Glover-West retort gas. The gas made in the Dessau retorts had a gross calorific power averaging 557 B.Th.U., or 140·4 calories, per cubic foot; whereas the corresponding figure for the gas made in the Glover-West retorts was 581 B.Th.U., or 146·4 calories, per cubic foot. The Dessau retort system therefore affords 1058 cubic feet more gas per ton, while its calorific power, though lower by 6 calories per cubic foot, is appreciably higher than the mean for the gas now supplied in London. [The gross calorific power of the gas supplied the first quarter of this year by the Gaslight and Coke Company averaged 137·8 calories; * by the South Metropolitan Gas Company, 145·3 calories; and by the Commercial Gas Company, 139 calories. But the quantity supplied by the first-named Company greatly exceeds that supplied by the others.] Hence it will be seen that for the requirements of London—which, in the matter of the quality of gas, will be those of the rest of England a year or two later—the Dessau system of retorts furnishes gas of the desired quality, with a make of 1058 cubic feet per ton in advance of that furnished by one of the best of the rival contemporary systems of vertical retorts.

THE SUNDERLAND INSTALLATION.

If the gas manager is perchance still bound, in regard to the quality of gas supplied, by statutory provisions which have not as yet been amended to bring them into accord with modern practice, he can fulfil his obligations by carbonizing in Dessau vertical retorts as well as, or better than, by other systems of carbonization. The guarantees given by the Dessau Vertical Gas-Retort Syndicate in regard to the installation of sixty 4-metre vertical retorts at the Ayres Quay works at Sunderland were substantiated in a trial run of the bench which was supervised by Mr. Charles Dru Drury, the Engineer of the Sunderland Gas Company. The run was made on Jan. 6 to 8, 1910, and, without steaming, a make of 12,028 cubic feet of gas per ton of (Holmside) Durham coal was obtained. The gas had a gross calorific power of 635·4 B.Th.U., or 160 calories, per cubic foot. The make per ton is 255 cubic feet less than the mean make in the trials of Glover-West retorts quoted in Table IV.; but the calorific power is 54·5 B.Th.U., or 13·6 calories, higher.

The working results obtained with the Sunderland installation

* Compare Table IV., column 7.

* *Vide* "JOURNAL," for May 23, p. 511.

TABLE IV.—*Gas-Making Trials in Glover-West Vertical Retorts.*

Date. 1909.	Reference in "JOURNAL."	Duration of Trial. Days.	Description of Coal.	Percentage in Coal of		Moisture in Coke. Per Cent.	Cubic Feet of Gas per Ton of Coal.	Gross Calorific Power of Gas, B.Th.U. per Cubic Foot.
				Moisture.	Ash.			
May 20 to 24	Vol. CVI., p. 636	4	Washed Orrell Nuts	3·95	6·94	4·0	11,448	588·8
July	,, CVII., p. 166	(?) 3	Durham (Thornley)	1·08	3·24	9·5	13,102	573·6
September	,, CVIII., p. 42	(?) 3	Yorkshire Silkstone (Barrow)	1·64	5·95	12·5	12,435	584·9
,,	,, ,, ,,	(?) 3½	Wigan (Arley Mine)	1·39	3·58	12·05	12,145	576·2
	Mean			2·015	4·93	9·5	12,282	580·9

since it was handed over by the Vertical Gas-Retort Syndicate in January last year were given by Mr. Drury in the paper he read at the annual meeting of the Institution of Gas Engineers in Glasgow; and they speak for themselves. These results must not, however, be regarded as representing the utmost of which the Dessau system of vertical retorts is capable; for a remarkable improvement in the design of the Dessau setting was being perfected in Berlin while the Sunderland installation was being erected and brought into use. This improvement, which gives even better carbonizing results than those previously obtained from Dessau settings, was the outcome of numerous trials extending over some years at the Dessau and Mariendorf gas-works; and the manner in which it was achieved is worthy of the attention of any gas engineers who may have been fascinated by the specious stories circulated from time to time as to the advantages of carbonizing in larger and larger units. That real advance does not lie in this direction will be realized from a study of the considerations the outcome of which was the 1910 model of Dessau retorts.

Large *v.* Small Carbonizing Units.

In the course of the discussion on various papers on vertical retorts and large carbonizing ovens presented at the annual meeting of the German Association of Gas and Water Engineers in June, 1908, Dr. Bueb, the inventor of the Dessau system of vertical retorts, expressed himself (*inter alia*) as follows:—

Practical experience with the vertical retort had taught that it was a great mistake suddenly to enlarge its capacity. All sorts of unforeseen evils ensued, which could only be overcome with difficulty or with the sacrifice of other advantages. Since the present pattern of vertical retort had been brought out, further trials had been made both by the German Continental Gas Company and by the Imperial Continental Gas Association, under Mr. Körting's guidance. The object of these trials was to increase the capacity of the retorts. They were not yet completed, and it would only be possible to give a trustworthy report on them in the course of a year. It could, however, be stated now that no economically improved result was attained by increasing the size of the charge. The trials which were being carried out at Mariendorf and Dessau with two different sizes of retorts proved that as the capacity of the retort was enlarged, the fuel consumed in heating it showed a relative increase. The speaker would therefore warn his hearers not to pin great faith on the enlargement of the carbonizing chambers. The figures now published for the working on a large scale at Zürich and Mariendorf might, in the speaker's view, be taken as the practical limit of what was attainable. If the retorts were enlarged, the figures would not be improved, but probably deteriorated. It should be remembered that three years ago no gas engineer considered that such figures could be obtained on a large scale of working.*

It will be seen from these remarks of Dr. Bueb that an increase in the size of vertical retorts had already been tried three years ago in connection with the Dessau setting, and had been found to constitute a serious disadvantage. Hence, as a result of experience gained thus early, the Dessau Vertical Retort Company had abandoned the idea of enlarging vertical retorts—an idea with which less experienced designers of vertical retort-settings are still toying. It was not, however, until the close of the year 1909 that it was announced that the Dessau Company had taken a very definite step in the opposite direction, and had made extended trials of a setting of small retorts with satisfactory results. The 5-metre Dessau vertical retorts had hitherto generally been arranged twelve in a setting—*i.e.*, one row of six retorts at the back of another row of six. The new retorts were made of rather smaller cross section by curtailing the longer axis so that three could be placed in a row from front to back of the setting, and six were arranged in each row. By this means, eighteen retorts were disposed in a setting which covered the same ground space as the former setting of twelve; and though the charge per retort was smaller, the amount of coal carbonized per setting was considerably increased. Thus one of the new settings of eighteen vertical retorts carbonized 391 cwt. of coal per 24 hours, against 275 cwt. for the former setting of twelve, though the charge per retort was reduced from about 1280 to 1065 lbs. The three retorts in a row from back to front in the new setting have their doors mounted on a common axle shaft, so that they are discharged and recharged as a single unit, with the result that a great saving in labour is effected.

In respect of labour and manipulation, the new Dessau setting may be regarded as consisting of units each taking a charge of 28½ cwt. of coal; though in regard to heating and rapidity of carbonization it comprises units each containing only 9½ cwt. of coal. This happy combination of the advantages in respect of labour-saving possessed by large retorts and chambers with the superior carbonizing qualities of small retorts, appears to be shared by no other type of setting; and it may be regarded as one of the greatest advances made in recent years in the design of carbonizing plant. It was at the Mariendorf works (in Berlin) of the Imperial Continental Gas Association that this advance was made under the direction of Mr. Edward Körting, who described the new setting early in 1910.† He quoted at the same time the results of an efficiency trial of it, conducted two months earlier by Dr. K. Bunte and Mr. Sentke on behalf of the German Association's Experimental and Instructional Gas-Works.‡ The results obtained in this efficiency trial may appropriately be set side by side with the mean results obtained by Dr. Colman in the four trials of the Glover-West continuous vertical retort installation at St. Helens already referred to. The comparative figures are set out in Table V.

Table V.—*Comparative Results of Trial Runs of Dessau and Glover-West Settings.*

	Dessau.		Glover-West.
Number of retorts in setting	18	..	8
Length of retorts feet	16·4	..	20
Descriptions of coal carbonized	Silesian	..	See Table IV
Mean percentage of ash in coal carbonized	4·28	..	4·93
Mean percentage of moisture in coal carbonized	2·91	..	2·01
Weight of coal carbonized per retort per 24 hours. cwt.	21½	..	46¾*
Weight of coal carbonized per setting per 24 hours. cwt.	391	..	373½*
Make of gas per ton of coal carbonized cubic feet	13,430	..	12,282
Make of gas per setting per 24 hours cubic feet	262,898	..	213,800*
Gross calorific power of gas made B.Th.U. per cubic foot	542·6	..	580·9
Dry coke used as fuel in heating the setting—			
Per cent. by weight of coal carbonized	11·8	..	12·49
Pounds per 1000 cubic feet of gas made	20·02	..	21·00
Mean percentage of ash in coke used as fuel	12·4	..	7·64
Dry coke, *minus* ash, used as fuel in heating the setting—			
Per cent. by weight of coal carbonized	10·34	..	11·54
Pounds per 1000 cubic feet of gas made	17·54	..	19·39

* These figures for the Glover-West setting reter only to the trial made with washed Orrell nuts. The time taken was not stated n Dr. Colman's reports on the other trials.

It will be seen from this table that from coal containing about the same proportions of ash and moisture the new Dessau setting produces 1150 cubic feet more gas per ton of coal carbonized than the Glover-West setting, and that the only offset which the latter presents is that the gas made by it averages 38·3 B.Th.U., or 9·6 calories, more in calorific power. The gas produced in the Dessau setting has, however, as nearly as may be, the same calorific power as the gas supplied Jan.-March in London by the Gaslight and Coke Company (*vide supra*). Apart from this lower calorific power of the gas made, all is in favour of the Dessau setting. This setting does more work in 24 hours, and the expenditure of fuel is appreciably lower. The comparison supplies ample evidence in support of Dr. Bueb's statement, made three years ago and quoted above, to the effect that increase in the size of vertical retorts is a step in the wrong direction. The eighteen retorts in the Dessau setting, which covers about the same ground space as the Glover-West setting, clearly produce more gas in 24 hours than the eight retorts of the latter, and afford a considerably greater make per ton of coal carbonized; while the fuel consumed in heating the setting is appreciably lower.

(*To be concluded.*)

* See "Journal," Vol. CIII., p. 777. † *Ibid.* Vol. CIX., p. 96.
‡ *Ibid.*, Vol. CIX., p. 27.

DESSAU RETORTS v. "FULL" HORIZONTALS.

By A Carbonizing Engineer.

In considering the claims of vertical retorts, it is surely a mistake to compare the results obtained from this modern system of carbonization with those obtained from small charges of coal in horizontal retorts. Those engineers who have altered their method of working from six-hour charges to those of twelve hour, well know that the change has made an astonishing difference in their results both in the make of gas per ton, the B.Th.U. obtained per ton, the quality of the coke, the yield of ammonia, and the quality (and sometimes the quantity) of the tar produced. To these improvements must also be added a notable saving in labour.

Present users of horizontal retorts worked with small charges must first carefully consider to what extent they could improve their results by extending the duration of the charge, before jumping to the conclusion that vertical retorts would effect an improvement unobtainable by horizontal retorts. This was the impression received by the writer on reading Mr. Dru Drury's admirable Gas Institution paper on the Dessau vertical retorts at Sunderland. No fault could be found with the paper itself, which was indeed a model of what a technical paper should be; but it is noticeable throughout that the results from the verticals are all being compared with those from small charges in horizontal retorts. Mr. Drury shows how great is the improvement comparing one system with the other; but it is a fact that full charges in horizontal retorts would in most respects show an equally substantial improvement over those obtained with small charges.

The personal factor, too, must not be forgotten. Any engineer adopting vertical retorts and who thereby does, to some extent, stake his reputation on a choice of a new process—and as such vertical retorts must still be considered—naturally gives his undivided attention to the working of the installation. And there is no doubt the new system receives far more close and careful supervision than the old horizontal retorts had ever received. This sort of thing greatly adds to the efficiency of the particular plant or process. It is also fairly certain that those engineers who have during the past year or so changed their system of small

charges to those of long duration have, as a consequence, paid more attention to the retort-house, with the result that some of the improvement effected is due to extraneous causes.

To deal in some detail with the working results obtained from vertical retorts at the Ayres Quay works at Sunderland, as compared with those obtained from horizontal retorts at the same Company's Hendon works, as published by Mr. Drury, it must be at once acknowledged that very considerable improvement is shown in the case of the verticals. The make of gas per ton with the verticals is 12,647 of 15·52-candle power (No. 2 "Metropolitan" burner) and 590 (gross) B.Th.U. calorific power, as compared with 10,638 cubic feet of 18·22-candle power and 611 (gross) B.Th.U. with the horizontals. This shows a large increase in the make; but there is a considerable drop in the candle power, which must still be considered in these days of illuminating power standards, though the calorific power shows but a small reduction. Had the same coal been carbonized in full horizontal retorts to give 15·5-candle power gas, it is more than probable that the result would have been only a little short of that yielded by the verticals. But it is fairly evident that the Dessau vertical retort yields a good quality of heating gas, and better than any horizontal retort. There is no doubt that in a good many works fully-charged horizontal retorts are giving yields of 12,500 cubic feet per ton of 15½-candle power gas (No. 2 "Metropolitan" burner) from second-class Durham coal, of a quality no better than that used at Sunderland; and it must be remembered that, in the case of the Dessau verticals, about 1000 cubic feet is due to the admission of steam, which in itself must obviously increase the charges for fuel in the settings and in the boilers.

It is, of course, very convenient, and probably economical, to make a little water gas in this way; but it is not made for nothing. Again, of the extra make of 2000 cubic feet of gas per ton from the verticals, 368 cubic feet is due to air admitted for the revivification of the oxide. Too much should not be made of the question of a high fuel account, as on the new Dessau setting, with three rows of retorts, this item is very materially reduced. The tar made in the verticals—11·40 gallons per ton of coal—is high as compared with that obtained from horizontals even with full charges. There is also a good yield of ammonia, which in the case of the verticals was 28·66 lbs. of sulphate per ton of coal, as against 24·07 lbs. with the horizontals. Such an improvement might well be expected to result from adopting full charges in horizontal retorts, instead of six-hour charges.

Coming now to the question of the quality of the coke made, Mr. Drury states that the "coke from the verticals is distinctly denser and heavier than that from horizontals—the former, bulk for bulk, weighing about 25 per cent. more than the latter, and approaching much more nearly the quality of good oven-coke." The same statement, except as regards the weight, about which nothing definite is known to the writer, could be made concerning the quality of the coke from full charges in horizontals. A full charge gives an entirely different form of coke to that produced in a small charge; and where due regard is paid to the drop of the coke from the retort, to prevent undue breakage, the size, shape, and density of the coke are very similar to that produced in vertical retorts, and bear a fairly close resemblance to that from coke-ovens. Again, in the matter of the percentage of breeze, coke from fully-charged horizontals is found to make very much less than that made with small charges. The comparison would be equally as good as that shown by Mr. Drury in his paper in comparing the verticals with small charges in horizontal retorts. The tar, too, is much thinner with large charges, and of a specific gravity of about 1·140, as against 1·113 produced by verticals, as mentioned by Mr. Drury, and 1·200 or more produced by the small charges in horizontals. There is, also, no more than an average of 2½ or 3 per cent. of water in the tar, while the free carbon is very light, and the percentage of pitch low.

There is one direction in which there appears to be room for much improvement in the Dessau vertical retort; that is in the matter of pressure in the retort. That there should be as much as 4 or 5 inches of pressure during the first hour or so, when the make of gas is at its highest point, and when the quality is at its best, is a serious disadvantage. A retort is a porous vessel, and in its natural condition is full of cracks through which gas can and does readily pass at anything above atmospheric pressure, or rather the pressure in the setting. When working with full retorts, it is found necessary to use two ascension pipes to relieve the pressure in the retort during the first hour. If it is necessary with horizontal retorts it is surely much more necessary with intermittent vertical retorts, in which there is less space for the exit of the gas, and the whole charge is to some extent compressed by its own weight. The results would surely be much improved were this drawback removed. Is it not possible to provide a gas outlet at the bottom of the retort even at the expense of some structural difficulties?

There is one other point with the Dessau vertical retort, in the matter of heating, which hardly seems to coincide with theoretical considerations. The retort being tapered, it is obvious that the bottom part must contain considerably more coal than the top. Being an intermittent process, the bulky mass of coal at the bottom is only heated for the same period as the lesser thickness of coal at the top. This difficulty is to some extent overcome by heating the bottom part of the retort to a much higher temperature (to the extent of some 700° or 800° Fahr.) than the top. The difference in the temperature may not be so great as that stated; but the system of heating is in any case a graduated one, in which the variation between the temperature at the bottom and the top of the retort is considerable. The system, therefore, resolves itself into one in which the coal at the bottom and that at the top are carbonized at totally different temperatures. There is a correct temperature at which coal should be carbonized—varying to a small extent with different coals; but it cannot be right to carbonize one part of the charge at (say) 1500° Fahr., and another part at 2300° Fahr. It would at any rate appear that the coal at the top would not be completely freed of its volatile contents, while the coal at the bottom (and in any case that on the outside of the charge) would be carbonized hours before the retort was discharged. This system of graduated heating, which in the case of continuously worked verticals is essentially scientific, appears to be totally inconsistent with the complete carbonization of any intermittent charge.

Summarizing, therefore, the respective advantages and disadvantages of the Dessau verticals and the fully-charged horizontals, there is no doubt that the former derives some benefit from the fact that the bulk of the gas does pass up the cool core of the charge, and thereby neither the gases nor liquid products are split up to any extent. In the horizontal—full though it may be to all intents and purposes—the gas being light and the charge dropping ever so slightly, even if only to the extent of ¼ inch or ½ inch (which is inevitable), the bulk of the gas must obviously pass along the top of the retort and be split up to a greater or less extent. This fact may possibly account for the superiority of the Dessau vertical retort as the producer of a good heating gas containing a high yield of tar of good quality and, perhaps, more ammonia as compared with the fully charged horizontal retort. There is, however, no reason to believe that the actual make of gas per ton is any greater. The coke may be a little larger, harder, and denser than that produced in the latter, owing to the absence of a long drop in the case of the verticals, the absence of machinery to break it during the discharge, and the extra compression it receives in the retort as a result of supporting its own weight. From all accounts the wear and tear should be materially less with Dessau verticals than with horizontals; and the writer attributes this to the entire absence of machinery, te the fact that the retort standing on end is supporting its own weight and being tapered is particularly stable, and lastly, owing to the superiority of the producers used for heating the vertical retorts being deep and so constructed as to give gas of uniform quality.

In this latter respect the same advantages should be experienced by users of vertical retorts as that mentioned by Mr. Wilson in his Presidential Address, as the result of his experience with outside producers in his horizontal retort installations. In the case of horizontal retort-settings heated by single or double furnaces placed underneath, the producers are generally not scientifically adapted for giving gas of uniform quality, resulting in flame in the combustion chamber and local heating from the insufficient or excessive amount of secondary air required for burning producer gas with varying content of carbon monoxide. This is chiefly due to the use of furnaces too shallow in depth, and which entirely depend on regular filling and on the proper levelling of the coke for the production of gas of good quality. And even then, owing to the variation of the depth, the quality is continually altering. In the opinion of the writer, the comparative inferiority of the furnaces used in horizontal retort-settings is largely responsible for the excessive wear and tear of retorts and combustion chambers.

On the question of labour, there is little doubt that Dessau retorts will be operated at about half the cost of an up-to-date installation of horizontals. Taking the figure for the latter at 6d. per ton, that for the verticals should not exceed 3d. The advantage in this respect is, however, fully counteracted by the heavier annual capital and sinking fund charges in the case of Dessau settings. The balance of advantages is probably on the side of the Dessau system, but not to an extent which would warrant its wholesale adoption in place of horizontals worked on up-to-date principles.

VERTICALS.

By R. W. E.

THE abundance of valuable and exhaustive information given in the papers written by the four members, Messrs. Dru Drury, Newbigging, Leather, and Holmes-Hunt, for the recent Institution meeting, deserves and I believe obtains the hearty thanks of all engineers who at this moment are seeking the particular vertical which will best suit their "corner."

Mr. Allen struck the true note when he asked for more facts and figures—not because the writers had withheld any valuable information, but because what was submitted was of such an excellent nature that one felt compelled to seek for additional particulars, not only in corroboration but to qualify or amplify the details in making comparisons with the two descriptions of verticals, and also against horizontals.

The first point which appeals, and certainly calls for modification in future installations, is the capital cost. Intermittent and continuous at Sunderland and Manchester respectively are given at about £180 per ton. That this cost is at least 75 per cent. more than horizontals with machinery there appears but little doubt. Therefore, if verticals are to make headway, the various

makers must cut down their costs; and doubtless they will readily do so when more contracts are forthcoming, and competition lights-up more fiercely.

The second point is undoubtedly the huge saving in wages. Sunderland costs appear about twice as high as Manchester; but there was some light thrown upon this by Mr. Charles Hunt, who explained that in the new settings of eighteen the wages worked out at about one-half those at Sunderland, and Mr. Hunt doubtless took his usual method of erring well on the safe side. It may, therefore, be taken that with both intermittent and continuous, the wages will ultimately be less than 4d. per ton. This in itself is enough to make one throb with eagerness, and call for immediate extensions (assuming they are likely to be required in the near future) and to reap this great saving. Some works are still in the region of 2s.; and where this is the case, the economy will be substantial.

The next point is the make of gas per ton, which is higher than the best horizontals. But it is difficult to make close comparisons, having regard to the various qualities and descriptions of coals carbonized in different parts of the country. Then, again, fuel is an important matter. But we have a wide difference between intermittent and continuous—the latter showing a considerable saving. Manchester fuel is given as slightly over 10 lbs.; and Mr. Drury rightly paid tribute to this point in his reply.

Residuals all show improvements, particularly in the liquid description (tar being better in quality). The quality of coke is important; and it will be necessary to investigate this point more closely when making a selection between intermittent and continuous. The former appears to yield a denser coke, which would probably not be welcome in large residential districts. The recovery in residuals ought to be very substantial, and cannot be neglected—especially in these days of good markets for tar and sulphate.

Renewals and upkeep we are unable to ascertain from British experience; but one would be inclined to assume that these should be well below horizontals. Excepting this and capital expenditure, all other points show very favourable improvements over horizontals; and in the case of wages and make per ton, as well as liquid residuals, the increases are highly attractive.

There is no doubt but that many converts have already been made, and others will follow. Meanwhile, those who are fortunate enough to be in a position to take early advantage of verticals will, it is hoped, give their experience in due course, and so enable us to make comparison with the valuable information which was so generously and ungrudgingly given by the four gentlemen mentioned, and to whom everyone is grateful.

SHALE-RETORTS AND CONTINUOUS VERTICALS: A COMPARISON.

[Communicated.]

A good deal of similarity exists between the successful shale-retort and the continuous vertical retort; and it is a matter for surprise that gas engineers have been so long developing their retorts on the lines of those used with such satisfactory results in the shale industry. This article is written for the purpose of making a comparison of some of the essential features of the shale-retort and the vertical gas-retort. With the shale, as used in the Scottish oil-works, not more than some 16 per cent. is of any value whatever—the remainder being entirely ash. No visitor to Edinburgh can have failed to have noticed the enormous artificial mountains of shale-ash, amounting to millions of tons, standing out conspicuously against the horizon. These huge heaps constitute the waste from the shale-oil industry, and have entirely baffled all attempts to find some purpose to which this useless material could be put.

The shale-retort settings are entirely uncovered, and in this respect are similar to coke-oven installations. There certainly appears to be no need for any covering (especially as very little labour is required to operate them); and by this means considerable capital cost is saved. Above each vertical shale-retort is placed a hopper which has an open top and is continually being replenished with supplies of shale acting as a funnel for filling the retort beneath it. The hopper is invariably kept nearly full, and is directly connected to the top of the retort without the interposition of any valve, cock, or slide. As fast as the ash is removed from the bottom, so does the shale slide down the funnel into the retort. The gas outlet pipe is placed at a point just below the hopper and at the top of the retort. In spite of the hopper having no valve either at top or bottom, no gas escapes nor is air admitted through the shale in the hopper. The reason of this is that a level gauge is maintained in the top of each retort; and, besides, should a little air be admitted, it would not be a serious matter, as will become apparent when it is explained that the gas from the shale, after its contents of light spirit have been extracted by washing, is used to heat the retorts.

The retorts are 50 feet or more in length. They are circular in shape, tapering from a diameter of about 20 inches at the top to some 36 inches at the bottom. They are constructed partly of bricks and partly of cast iron, and are found to last at least twelve years or more with very few, if any, repairs. The bottom part of the retort is built of firebricks for about one-third of its height; and the remaining two-thirds at the top is formed of cast iron. The retorts are heated partly by the gas from the shale and partly by producer gas; it being found that the gas from the shale is hardly sufficient in quantity to provide the full heat required. A retort of the size mentioned will carbonize some 4 tons of shale per diem, while a ton of shale will produce some 22,000 cubic feet of non-luminous gas of about 150 B.Th.U.

The gas is admitted to the combustion chamber situated at the bottom of the retorts, around which it travels, finally leaving the setting at the top. The result is that the heat varies from a comparatively bright heat at the bottom—say, 1800° Fahr.—to a dull heat (almost black) at the top. In this way, the shale is gradually distilled, firstly with a dull heat and lastly with a bright heat.

At the bottom of the retort is a circular ledge projecting on the inside; and it is on this ledge that the charge is supported. Fitted to the bottom of the retort is an iron chamber in which the distilled shale-ash is stored awaiting removal. In this chamber is fitted a vertical shaft, on which is placed an arm at a point on a level with the circular ledge to which allusion has already been made. The shaft is continually, and slowly, revolved by ratchet motion operated by a long connecting rod extending the full length of the retort beds, and worked by the crank of an engine. By this means, the arm slowly revolves round the ledge, thereby sweeping off pieces of the shale-ash. These pieces fall into the chamber at the bottom of the retort, and are removed at convenient periods through sliding-doors. Steam is admitted at the bottom of the retort, to quench the ash before removal; and it also has the effect of increasing the make of gas by converting the shale-coke to water gas and also augments the production of ammonia. This latter bye-product is produced to the extent of 40 lbs. to 50 lbs. of sulphate of ammonia per ton of shale. Other bye-products are tar (generally used for the heating of the boilers), light motor spirit, light oils, lubricating oils, paraffin and paraffin wax (used for candle-making), and coke from the distillation of the oil. This coke is almost entirely composed of carbon.

The labour required for operating the retorts is extremely small. It is found that one man at the top of the retorts is capable of filling the coal hoppers for an installation distilling 120 tons of shale per diem, while another man at the bottom attends to the removal of the ash. In this way, two men during the daytime and two men at night (or four in all) are able to do the entire work for a plant of 120 tons daily capacity.

Having briefly explained the nature of the retorts in which the shale is distilled and the process in general use, it will be seen that very little difference exists between them and the continuous vertical gas-retort settings. With the latter, although it is the custom to maintain a level gauge in the retort, it is thought necessary to provide some form of valve by means of which the coal in the main hopper above each retort is divided from the retort itself. The reason of this is obvious. With the gas-retort it is equally important to prevent air from being drawn in through the coal as it is to ensure that no gas is lost in the same direction; while in the shale process the quantity and quality of gas, as in the coke-oven industry, is a minor consideration. The retorts in each case are tapered; but those used for shale are much longer and of greater bulk.

In the matter of coke-extraction, the method used to withdraw the shale ash would hardly be applicable to the vertical gas-retort, as the probability is that the quality of the coke would be seriously impaired owing to breakage. In the case of the shale ash this is, of course, of no consequence. In the question of coke extraction, a good deal of ingenuity has been displayed in both the Woodall-Duckham and the Glover-West plants. It is a matter which must have given the inventors much trouble, and it would certainly appear highly desirable that the coke should be comparatively cool by the time it reaches the coke-extractor. The storage-chambers and doors provided for retaining the shale-ash until sufficient has accumulated for removal are also identical with those adopted by the two previously mentioned systems of continuous vertical retorts.

In the matter of heating the retorts, it would appear that, while the shale process is admirably adapted for being conducted with a low fuel account, owing to the fact that the retorts are of great height and are each heated to a considerable variation of temperature, the vertical gas-retorts, by reason of the heat of carbonization, are not nearly so well accommodated in this respect. It is, however, by no means the usual practice in the shale-retort settings to heat the secondary air. The exceptionally long life of the shale-retorts, though the heat at which they are used is by no means so great as with gas-retorts, leads one to anticipate to some extent the same favourable feature in the case of the latter; and it would seem to be reasonable to suppose that a retort standing on end like a column should be more durable, and retain its shape for a longer period, than a horizontally placed retort depending mainly on transverse walls for its support.

In the shale-retorts, it is the custom to admit sufficient steam at the bottom of the retort to convert to water gas the whole of the coke remaining from the distillation. This coke, however, exists in the shale to only a very small proportion; and it, therefore, requires but little steam for this purpose. It is noteworthy that sufficient ammonia is produced per ton of shale to make from 40 lbs. to 50 lbs. of sulphate of ammonia—a figure which is about twice the amount produced in gas-works. Is this due to the presence of more nitrogen in the shale, or to the gradual increase in the heat of distillation? The last-mentioned reason would appear to be the more feasible. The conditions, in fact, in a shale-retort should be almost ideal for the production of a

large amount of ammonia. One of the features of the Glover-West plant is that the upper part of the retort is maintained at a lower heat, owing to the waste gases being conducted round this part of the retort before leaving the setting. This fact should render this system a favourable one for the production of a good yield of ammonia.

In this connection, it is noticed that Mr. Newbigging, in his paper on Glover-West verticals, gave figures in his "Summary of Tests," which as far as the particular Lancashire and Derbyshire coals used in the tests are concerned, support this contention. These two coals give an average of 37·6 gallons of 10-oz. liquor per ton of coal—a very large yield. This high figure was not, however, maintained in the case of one test with a Yorkshire coal, which gave as low a yield of ammonia as the others were high.

In the matter of labour costs, the two processes are analogous—the common feature of both being an exceptionally low account. In other directions the two processes are hardly comparable; but sufficient has been stated to show that much similarity exists between what has been common practice for many years in the shale industry and a system which has only during the past few years been introduced with success into the gas industry.

OBSERVATIONS ON GAS COKE FROM THE STANDPOINTS OF THE COMMERCIAL MAN, THE ACCOUNTANT, AND THE GAS ENGINEER.

By Mr. E. Körting, of Berlin.

[Abstract Translation of a Paper read at the Meeting of the German Association at Dresden.]

It behoves the careful family man and business man from time to time to discontinue his work, in order to review his performances with a view to checking their efficiency. In the last ten years, gas engineers have aimed at many things and have achieved a great deal. Manual labour has to-day been so far displaced by machinery, not only in the retort-house, but in the coal and coke yards, that little more remains to be done in this direction. For instance, since retort-house wages have receded from over 3½d. per 1000 cubic feet of gas made with direct-fired settings and hand labour to 0·6d. with settings of eighteen vertical retorts, it must be recognized that a remarkable revolution has been accomplished. Further, 20 per cent. more gas, of approximately the same calorific power, is being obtained from a given quantity of coal, while the tar and ammonia have been improved both in quality and in quantity. These achievements afford compensation for the increase in the price of coal and in wages. Moreover, in another important item of expenditure in gas manufacture—viz., cost of repairs—there has been a not inconsiderable diminution. The Mariendorf vertical retort-settings have now been in action for approximately four years, and not a single hole has developed in the retorts, nor have they become deformed to any appreciable extent. Moreover, the De Brouwer conveying trough, considering the work it has to do, entails very little expenditure on repairs.

Interest in gas coke, the most important bye-product of the gas-works, has, however, been strongly affected by the changed conditions. Twenty to forty years ago, the scientific era of gas manufacture began with the classic work of Bunte and Schilling on producer settings. The capability of the gas engineer was for a long time judged as being inversely proportional to the consumption of fuel in his settings. When the author was working at the Hanover Gas-Works at the end of the seventies, the Munich settings, with 10 per cent. fuel consumption, were regarded as the climax in the way of retort-settings. Klönne and Hasse-Didier endeavoured, with more or less success, to achieve the same results. How do these old settings stand relatively to present-day conditions? The author has endeavoured by careful investigation to find an answer to this question, with the following result.

The Hasse-Didier settings, which earlier required 12 per cent., now need 16 to 18 per cent. of fuel for heating the retorts, while the inclined settings, which likewise were reckoned to consume 12 per cent. of fuel, now on the average require fully 16 per cent. Similar results are reported from other places. What is the reason? In the first place, the old methods of computation were not quite unobjectionable, and no gas manager would now prescribe a maximum of 10 per cent. fuel consumption to his assistants. Our methods of working have also greatly changed. A larger make of gas is obtained per ton of coal, by the employment of higher heats and longer periods of carbonization. Dr. Bueb has taught us to fill our retorts much fuller; and the technical advantages incident thereto have resulted in a considerable diminution of labour, but at the same time an increase in the cost of fuel. We arrive, therefore, at the disagreeable conclusion that fuel consumption is worse than it was in former years. This does not, however, apply to the latest types of setting. With the settings of 18 vertical retorts, the author has ascertained exactly that with Silesian coal 11½ per cent., or, taking account of the settings on low fire and the burning-out of scurf from the retorts, 12½ per cent., of fuel is consumed, which is probably not more than was required by any one of the earlier types of settings. The increased yield in gas and bye-products may, therefore, be regarded as a net gain. In any case, it appears extremely important that we should be quite clear how we are working with our settings, and what means are available to control them. We know obviously how much coke we have sold, because we know how much money has been received from the sale of coke; but in regard to the real quantity of coke sold, we are only incompletely informed. Thus, if we sell by weight, the whole quantity of water contained in the coke is reckoned; and that may rise to 20 per cent. and more. If, on the other hand, we sell by measure, and convert the measure into weight by calculation, the density and size of the coke plays an important part, and great want of exactness is unavoidable. Neither do we know how much coke we produce. Analysis teaches us that the usual descriptions of coal yield in the crucible an amount of coke varying between about 60 per cent. with Silesian, and about 70 per cent. with Ruhr coal; while the yield of coke in vertical retorts or large chambers is certainly higher than in the crucible, as the carbon of the decomposed hydrocarbons is added in this case. Assuming that, with the aid of numerous analyses, exact figures for the yield of coke are available, there remains still the question whether the coke produced is to be reckoned as free from water, or whether a certain proportion of water is to be allowed for in the coke sold, and in the latter case what the percentage of water allowed shall be. It would obviously be possible also to calculate the coke for sale, whether containing much or little water, into the corresponding weight of coke free from water. There is no fixed starting-point for determining the fuel consumption in settings. Where the coke is used cold, it can be weighed, but naturally its moisture is weighed with it. On the other hand, hot coke is more or less completely insusceptible of control in this manner.

Clearly the unknown quantities are predominant. How can useful results be arrived at? Let us take the case of the old gas manager with his 10 per cent. of fuel consumption. If he added to it the figures for the coke sold, he obtained naturally a correspondingly low production of coke. The author's father adopted another method. He took the make of coke as fixed and unalterable—viz., at 70 per cent. of the weight of the coal, which corresponds on the average, with Westphalian coal, fairly exactly to absolutely dry coke. The difference between the coke produced and the coke sold was then the amount consumed in heating the settings. But as the coke always contained water, and was not sold in the dry state, the fuel consumption necessarily worked out low, and was the lower the wetter and smaller the coke. There are still great differences in the methods of calculation employed in modern gas-works, as the extremely divergent figures for the yields of coke indicate. The results from a few towns may be quoted in illustration. The coke produced from Silesian and Saar coal is as follows: Munich, 66 per cent. by weight, Nuremberg, 77 per cent.; from English coal, Copenhagen 76 per cent., Königsberg 66 per cent.; and from Ruhr coal, Cologne 75 per cent., Elberfeld 70 per cent. Breslau, which works with Silesian coal only, and should therefore have one of the lowest productions, stands, with 73 per cent. by weight, far in front of Berlin, which gasifies a preponderance of English coal, and attains only to some 71 per cent. yield of coke. These figures agree so little that they are almost useless for comparative purposes; and as the production of coke and the amount used as fuel generally are calculated together, the fuel consumption must also be regarded as very questionable. If, for instance, adopting the author's father's method, the production of Copenhagen and Königsberg were taken at 70 per cent. of water-free coke, the former place would use 9 per cent., and the latter 19 per cent., of fuel, which are quite improbable figures. In these circumstances, it appears to the author out of the question to calculate the fuel consumption. Instead, it should be established every year by a sufficient number of practical trials how much coke the settings consume in normal working, either by weighing and determining the water in the coke when the furnaces are charged with cold coke, or, when they are charged with hot coke, by the following method: The coke from the whole of the retorts of one setting is drawn, and as much as is required is used for charging the furnace, and the rest laid aside and weighed cold. The rest of the settings are charged with cold coke; and the production of coke in them is determined in the usual manner. This trial, extended over several days between two periods of clinkering, gives the coke consumed in percentage of the coke produced. The coke used as fuel needs only to be multiplied by the figure for the production of coke in order to give the ratio of the fuel consumption to the coal carbonized. The figure thus obtained applies for normal working. Small discrepancies in the figure for the production do not seriously affect this method of calculation. Allowance must be made by exact determination once a month for the coke consumption in heating-up fresh settings, in burning-out the retorts, &c. This generally amounts to 1 to 1·5 per cent. The value so found must be introduced into the calculation. With modern scientifically controlled settings, such as the vertical retort settings, in which the draught, position of the damper, temperature, &c., scarcely fluctuate, the results are naturally very uniform. The high proportion of ash in certain coals may cause a difference.

In order critically to examine the figures for coke production, it is important first to obtain an impression of the requirements of the coal business. At the end of the last and the beginning of the present century, the production of gas coke increased much more rapidly than the population; and there was a big depression in prices. In time, this was changed by the diminution of the amount of coke brought on to the market, owing to its use for

water-gas production and by steaming in vertical retorts, while the quality was improved. The net prices obtained for coke and breeze in Berlin have been as follows:—

1903	13s.	6d.	per	metric ton.
1904	14	0	,,	,, ,,
1905	15	0	,,	,, ,,
1906	15	0	,,	,, ,,
1907	17	6	,,	,, ,,
1908	21	0	,,	,, ,,
1909	20	0	,,	,, ,,
1910	18	0	,,	,, ,,
1911 less than	16	0	,,	,, ,,

For the moment the prices unfortunately are again depressed; but this is chiefly due to the mild winter. What can be done to avoid low prices for coke? In the first place, active propaganda or advertisement is necessary; and all that there is to learn must be ascertained regarding competing fuels. Why is oven coke, which is so much dearer per unit of heat, sometimes preferred, and why have brown coal briquettes become popular? The value of gas coke itself, its value for central heating plants, and coke-stoves for the heating of rooms must be brought before the notice of the public very clearly. In Germany, this is an important matter for the Central Organization for Promoting the Sale of Gas to take up. The English have had an original idea in this direction. The coke is put up at the gas-works in large paper bags containing 28 lbs., and taken for sale into the lower quarters of the town. Many thousand tons have thus been disposed of by the London Gas Companies. In Berlin for some years the gas-works have sold to a few large merchants, who were in a position to pay for the coke on receipt. They sold to the small merchants on credit. Now, rightly or wrongly, the customers of the latter formed the view that they were cheated as to weight or measure, and many of them sought to buy direct from the gas-works. The coke merchant, seeing his living endangered, started underbidding the companies, with the result that he worked at a loss; but the market prices were so depressed that the gas-works became also injuriously affected. It then occurred to the large firm of Stinnes, who were then renewing their arrangements with the Westphalian Coal Syndicate, to establish a powerful selling organization for the whole of Germany. By manipulating prices and amalgamating local firms, it has endeavoured to secure a controlling influence in Berlin, and so far, not without some success. Consequently, the position of the small merchant has become worse. He must either go-under or join concerns with more capital. When he does the latter, the larger merchant becomes superfluous, as the new amalgamations are in a position to treat directly with the gas-works with advantage.

These new associations must certainly join with the gas-works in an active propaganda to further the sale of coke, and to recover the confidence of the public. The gas-works must, moreover, have regard to the quality of the coke. It must avoid carbonizing coal containing an excessive amount of ash, or must mix carefully coal containing much ash with coal containing but little, in order to produce coke with a low content of ash. Professor Bunte at one time advocated the sale of coke being based on the amount of ash it contained. Secondly, the gas-works must avoid selling water instead of coke. [A letter from a consumer is quoted at the close of the paper to show how important this is.] That is to say, if it is sold by weight, a certain measure must also be guaranteed. If the coke has been soaked with water, the number of bushels guaranteed per truck load will weigh (say) 10 per cent. more than the weight at which they should be actually reckoned. In other words, the 10 per cent. of water is not paid for. But what will the merchant do? He will in most cases regard the 10 per cent. of water as a bonus to him, and thus accomplish what the gas-works endeavoured to avoid. There is nothing for it but that the gas-works should actually sell dry coke, though naturally the retailer will be displeased thereby. Actually the author has lately had a number of complaints from retailers on this score—the coke is too light they say. But that matters not, the gas-works should serve the interests of the public, not of the merchant.

Obviously also when large coke is sold, it should be as clean and large as possible; and, similarly, broken coke should be of good and uniform size. Further, the coke should approach as closely as possible in character to the more highly valued oven coke. This is proved by the great popularity of the coke from vertical retorts, which is keenly competing with oven coke for use in central heating plants. On this account, the author's Company have kept all their vertical retorts at work throughout the year, so as to be able to give their customers about 50 per cent. of vertical retort coke. Owing to its greater density, a rather smaller volume for a given weight can be guaranteed without difficulty. But this has not proved necessary, for reasons which will appear. With active propaganda, and a moderate development in the amount of gas made, it should be possible to secure good prices for gas coke in the future.

We are now in a position to develop the principles on which the quantities of coke sold and produced should be reckoned. If coke is sold so that the public do not receive too little—*i.e.*, if we correct the weight by the measure in such a manner that only a small percentage of water (say, at the most, 5 per cent.) is sold with the coke as such, we are able to assume the figures thus arrived at to be directly the figures of coke sold. Thus, if a truck containing coke with 15 per cent. of water weighs 11 tons, only 10 tons are reckoned as sold, and the purchaser obtains 9½ tons of absolutely dry coke. By adding to the fuel consumption ascertained by regular trials the figures for the coke sold obtained in this manner, we obtain the figure for the coke produced, which will be always higher than the mean of the yield determined by the crucible test from the different kinds of coal used. The figure thus obtained shows how much moisture has been sold as coke, and whether the necessary care in this respect has been exercised.

Now, as to the technical means which are available for the production of coke as large in size and as free from water as possible. The two requirements are intimately related. If the hot coke is suddenly drowned in water, the large pieces split up. On this account, the author regards the principle of the De Brouwer trough as faulty. The practical solution appears to be obtained by the submerging appliance of Herr Göhrum, which need not be referred to further, as he is describing it in his own paper at the meeting. [See report of proceedings at the meeting on p. 25 of to-day's "JOURNAL."] This, however, scarcely comes into account in regard to settings of 18 vertical retorts, as there it is a question of handling large quantities of coke in a short time, representing a ton of coal per minute, and the cloud of steam in front of the oven would be too great an inconvenience.

On the other hand, the De Brouwer trough, in conjuction with inclined shoots beneath the settings, is mechanically an ideal solution. The large quantity of coke is gently drawn away and conveyed into the open. It is then only necessary to get rid of the harmful excess of water, which is done in the following way. The accumulation of water in the rising trough is avoided by providing sufficiently large holes for it to flow away. The quenching is done as sparingly as possible by means of sprays operated by the slabs of coke, and the large lumps even retain a hot core. The conveying trough takes the coke directly into large trucks, of which a row stands ready in front of the retort-house, and so overlap one another that no coke can fall down between them. This arrangement is shown in fig. 1. The coke is left in these trucks for half an hour, so that by the heat left in it a great part of the moisture is dissipated, while any risk of the store of coke being fired from the hot cores is avoided. After this drying and cooling, the coke is raised by the lift and sorted through the shuttle-screen S, shown in fig. 2, into the different sections of the high receiver. This is important, because the small coke contains the most water, and would wet and injure the large pieces if it were not separated from them. At the same time care must be taken that the coke never drops from a height into the receiver. To ensure this, an inclined plane is placed opposite the end of the shuttle screen S, and this soon fills with coke. On opening one of the slides (marked 1, 2, 3 in fig. 2) in the trough, a second is brought into the first position, and then a third, and so on.

The other extreme is represented by Arrol-Foulis drawing machines with horizontal retorts. In these, the coke is first broken up by rakes, and falls in small pieces on to a shoot on the stage level, and thence into a truck on the ground level, where it is quenched by sprinklers. The vertical retort coke produced and handled by the first method has a weight of 10 tons per truck of given volume, whereas the mishandled coke from the horizontal retorts weighs 11·7 tons per truck.

The author's views may be summarized as follows: It is necessary for us (1) to produce coke of better and better quality; (2) to market it in a commercial way; (3) to ascertain exactly our own working results; and (4) to agree as to the basis on which practically useful comparable figures can be arrived at.

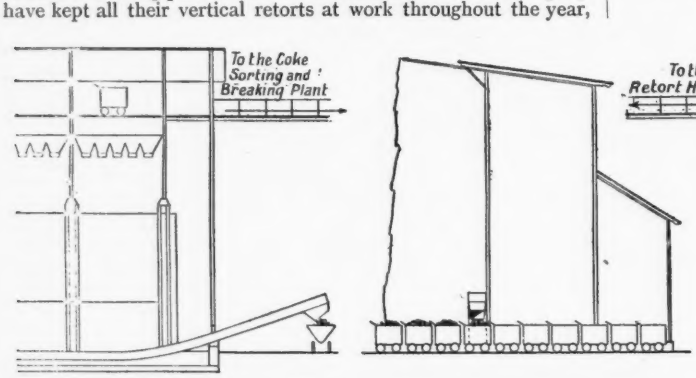


Fig 1.

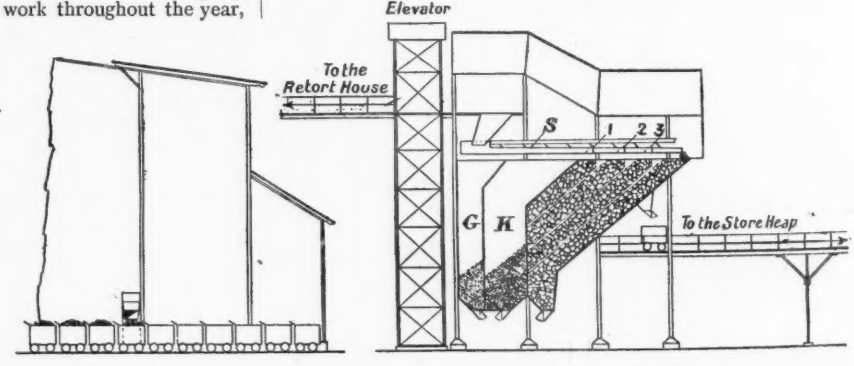


Fig. 2.

EXTENSIONS AT STOCKPORT GAS-WORKS.

Coal and Coke Handling Plant.

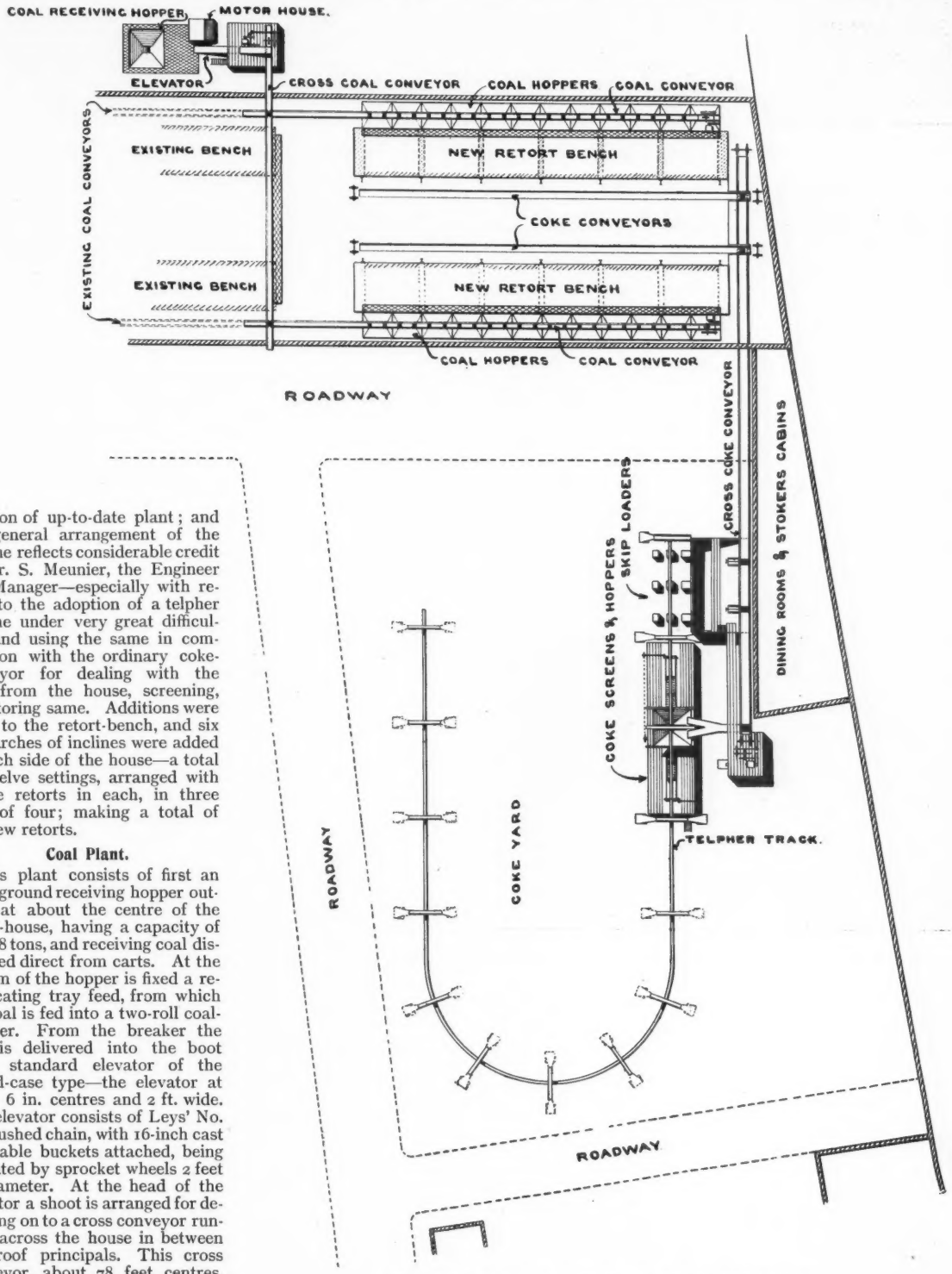
The following particulars of some extensions to the coal and coke handling plant at the Stockport Corporation Gas-Works have been sent to us by the Contractors for the work, Messrs. Robert Dempster and Sons, Limited, of Elland.

The extensions to the retort-house at the works which have recently been completed comprise a somewhat interesting combination of up-to-date plant; and the general arrangement of the scheme reflects considerable credit on Mr. S. Meunier, the Engineer and Manager—especially with regard to the adoption of a telpher scheme under very great difficulties, and using the same in combination with the ordinary coke-conveyor for dealing with the coke from the house, screening, and storing same. Additions were made to the retort-bench, and six new arches of inclines were added at each side of the house—a total of twelve settings, arranged with twelve retorts in each, in three rows of four; making a total of 144 new retorts.

Coal Plant.

This plant consists of first an underground receiving hopper outside, at about the centre of the retort-house, having a capacity of some 8 tons, and receiving coal discharged direct from carts. At the bottom of the hopper is fixed a reciprocating tray feed, from which the coal is fed into a two-roll coal-breaker. From the breaker the coal is delivered into the boot of a standard elevator of the closed-case type—the elevator at 54 ft. 6 in. centres and 2 ft. wide. The elevator consists of Leys' No. 600 bushed chain, with 16-inch cast malleable buckets attached, being operated by sprocket wheels 2 feet in diameter. At the head of the elevator a shoot is arranged for delivering on to a cross conveyor running across the house in between the roof principals. This cross conveyor, about 78 feet centres, is of the push-plate type. The trough, 16 inches wide, is constructed of 6-inch by 2½-inch channels, with ¼-inch bottom plate and 2½-inch by 2½-inch steel return angles. The chains are Leys' 600 bushed type, fitted complete with skidders and push plates 1 ft. 3 in. wide; the whole being operated by sprocket wheels 2 feet in diameter. Slide-doors fitted in the trough bottom deliver coal on to two new longitudinal conveyors; and the doors are arranged so that this cross conveyor can also deliver coal on to the two existing longitudinal conveyors—a necessary platform being provided alongside this cross conveyor, from which access is obtained by means of short ladders.

Two new longitudinal conveyors, arranged to deliver coal on either side of the house, are also provided on the charging side of the two lines of retorts; the length of these new longitudinal conveyors being 120 feet each. The construction of the conveyors is exactly similar to that of the cross coal conveyor; the trough being arranged, however, with two slide-doors to each bed of retorts, so as to efficiently supply the whole length of the storage hoppers. The longitudinal conveyors are supported on the top of the hoppers on cast-iron stools. The driving gear, which is

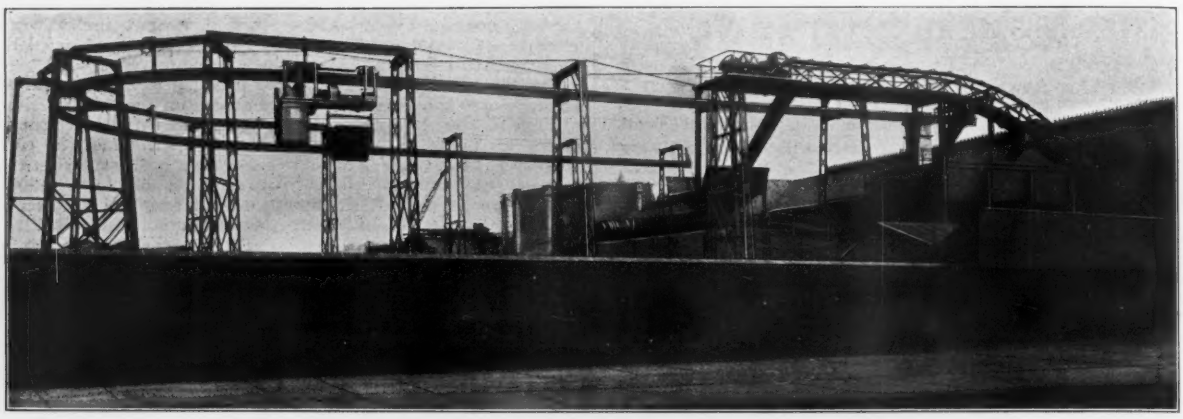


Plan of the Stockport Gas-Works Coal Plant and Coke-Yard.

situated at the end of the house, consists in each case of steel gearing, driven by separate motors; the necessary tension gear being fitted to the whole of the coal-conveyors for adjusting same.

Coke Plant.

The new coke plant consists of two sets of scraper coke-conveyors, which are arranged in front of the benches; the coke being



General View (from the Road) of the Coke-Handling Installation.

discharged from the retorts into a trough, in which the coke-conveyor is fixed. The trough, 2 ft. 6 in. wide, formed of rolled steel channels, with steel bottom plate, and cast-iron renewable bottom and side plates, is sunk to about the level of the stage floor. The chain is 18-inch pitch, and the steel rakes, with cast-iron rubbing shoes, are bolted on at 3-feet pitch. The chains are covered in front of the retorts by steel plates supported on cast-iron brackets bolted to the existing floor-joists; and the return chain, carried close up under the floor, is arranged to return on suitable angles slung from the floor-joists. The driving gear is fixed at the end of the house. It consists of the usual steel gear; each conveyor being driven by a separate motor. Tension gears are fixed at the opposite end of the conveyors. These tension gears are of the automatic weighted type.

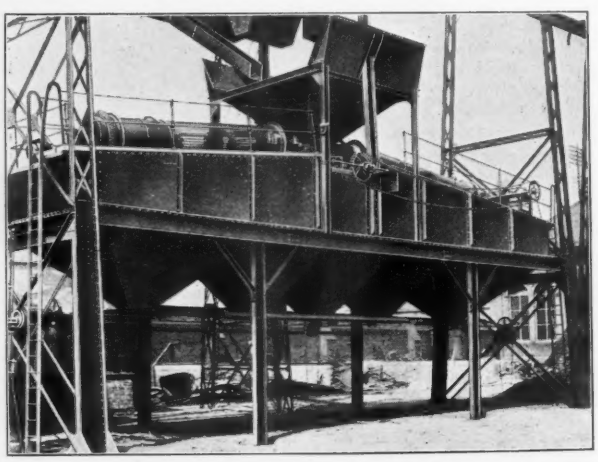
View Looking along the Cross Coke-Conveyer from the Retort-House.

The two hot-coke conveyors are arranged to deliver the coke on to a similar cross conveyor, fitted at the end of the house; the cross conveyor being exactly similar in design to the longitudinal conveyors running in front of the benches. The cross conveyor, however, after leaving the house, is carried up on an incline, and the trough and return angles are carried on suitable steel framework with the necessary trestles, &c., so as to discharge coke into a set of coke-bunkers situated at a distance of 50 feet from the retort-house wall. Suitable slide-doors are arranged in the bottom of the trough on the inclined portion of the conveyor, so that the coke can be discharged down to the ground without passing to the coke-bunkers, if required. The coke-conveyor is further extended past the coke-bunkers and is provided with an inclined shoot for delivering the coke direct to the hopper above the set of rotary screens.

The coke-bunkers nearest the retort-house have a capacity of 40 tons of coke. They are fitted with three sets of automatic skip-filling gear for automatically filling the skips of the electric telpher. They are arranged at one side of the telpher track; so that the telpher skip can be lowered direct into the automatic skip-filling arrangement.

The automatic skip-filling gear consists of a set of guides arranged in front of the slide-doors at the bottom of the coke-bunkers; and in between these guides is fitted a suitable platform, which is arranged to be raised and lowered according to the weight resting on the platform. The platform is connected by wire ropes passing over suitable guide-pulleys; the wire ropes being attached at the other end to two series of adjustable weights, so arranged that, when the telpher skip is lowered on to the platform, the weight of the skip is sufficient to depress the platform a matter of about 18 inches. This movement of the platform automatically opens the slide-doors of the coke-bunker—the doors being connected to the platform gear by suitable cranks and sprocket wheels. Immediately this movement is attained, the skip is held in position by another set of weights coming into operation on the rope-gear. The discharge of coke then takes place into the skip; and when a predetermined weight has been discharged into the skip (in this instance, it is about one ton of coke), the added weight of the coke presses down the platform a further 18 inches and lifts up the second set of weight gear. This further movement automatically closes the door of the bunker, and prevents any further flow of coke. On the skip being lifted from the platform, the platform itself returns to its original position without operating the door, which is held fast by a pawl and ratchet gear—the platform being thus ready for receiving the next skip. This arrangement of automatic doors does away with all question of an attendant at this position.

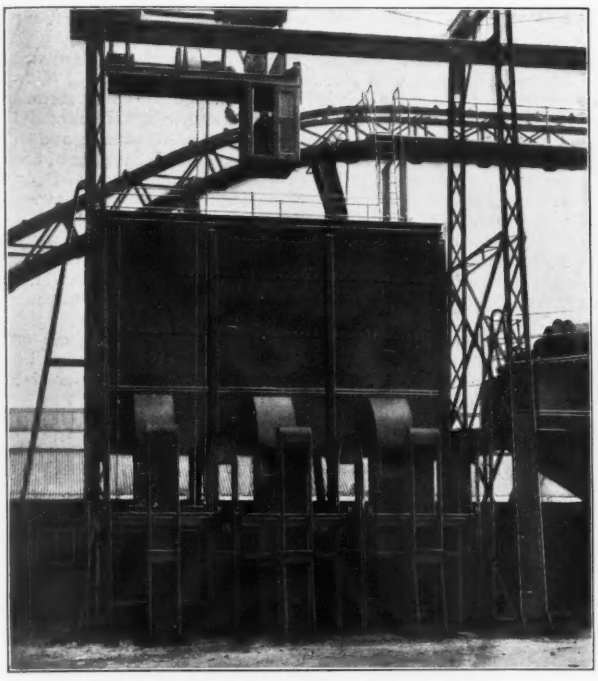
Just beyond the coke-bunker and immediately under the telpher track is fixed a coke-screening plant and hoppers. This plant consists of a receiving hopper fixed over the top of two rotary screens, which are 14 feet long by 2 ft. 6 in. in diameter. They are formed of two sets of perforated plates, with slide-doors for discharging all the coke into any hopper as desired. The rotary screens are driven, by cast-steel bevel gears, from a countershaft by means of a chain and chain wheel. The coke from the small receiving hopper is automatically delivered into either one of the screens by a reciprocating tray feed, which is adjustable.



Revolving Coke-Screens and Hoppers for Filling Carts, also Showing the Shoot from the Cross Coke-Conveyer delivering to the Overhead Hopper.

These rotary screens are fixed on the framework immediately above the coke-receiving hopper. Of a capacity of some 40 tons of coke of various sizes, the hopper is about 45 feet long by 12 feet wide. It is provided with division plates and sliding discharge doors, which are operated from the ground level by means of a chain and chain wheel. The coke can be delivered in sizes as required from the hoppers direct into carts.

The coke, as already mentioned, is delivered into the bunkers by means of the cross coke conveyor or direct into the hopper over the coke-screens. The coke which has been delivered into the bunkers is discharged by means of the telpher, and either deposited into the hopper over the screens or into the yard; or, if



Front View of the Coke-Bunkers, showing the Telpher Skip lowered ready for filling and the Cross Coke-Conveyor passing over the Bunkers.

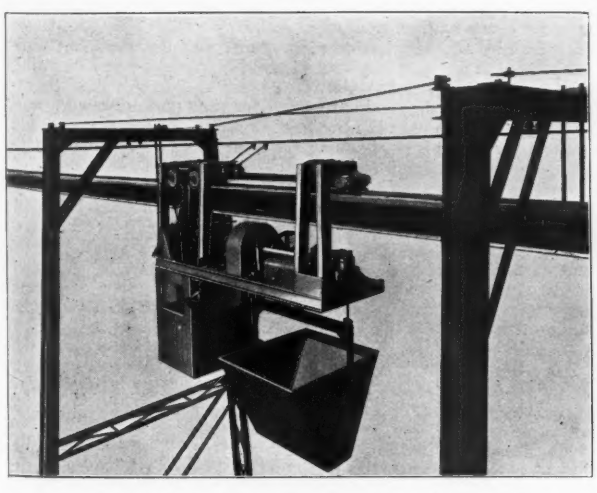
necessary, it is taken by the telpher from the stacking yard back to the hopper over the screens.

The telpher track, U-shaped, is extended over the whole area of the coke yard. The height of the track above the ground is 35 feet. It is of Dempster and Sons' new design. The track consists of 15-inch by 5-inch joist, on the top of which is mounted 7-inch by 2½-inch channel, with renewable bulb-rail fitted on top of the channel itself. Two overhead trolley wires of figure 8 section are attached to the top of the trestles, and from these the telpher collects its current. The whole of the trestles are cross-tied by means of tie-rods; and the ends of the track are provided with track-stops to prevent over-running on the part of the telpher driver.

Over the area of the ground under the telpher track about 2000 tons of coke can be stacked by means of the telpher, without trimming or other labour being required. The electric telpher is one of Messrs. Brooke and Dempsters' new patent machines, of the swivelling bogie type, with parallel hoist shaft, on to which the hoist ropes of the telpher coil direct. The machine is fitted with two Siemens crane type motors, one for hoisting and the other for travelling. The machine is capable of lifting a gross load of 30 cwt. at a speed of about 70 feet per minute, and travelling fully loaded at a speed of about 500 feet per minute.

The machine is fitted with interlocking gear to prevent mistakes in operation, and, generally speaking, it seems as near "fool-proof" as possible.

A good feature about the telpher seems to be that the coke is handled practically without breakage, as the skip can be lowered almost on to the heap before tipping—the tipping being done by the telpher driver by means of balance cord from the driver's cabin; this operation being done no matter what height the skip may be.



Detail View (from above) of the Electric Telpher and Skip.

The chief (and most important) feature appears to be that the coke is dealt with entirely by one man—the telpher driver, because as he lowers his skip down in the skip-guides of the automatic skip-filling device, as explained, the skip automatically operates the doors, fills the skip, closes the doors, and then the load is hoisted for delivery direct into the screen receiving hopper, or carried round and discharged on to the storage ground.

There should be very little wear and tear on this type of plant, seeing that the only wearing part is the telpher itself, which practically does not come in contact with any of the coke and grit.

The telpher appears to be exceptionally simple in its operation; and the combination of the coke-conveyor from the house and the telpher for dealing with the coke outside, provides a somewhat novel but very efficient arrangement. The coke is dealt with very economically; the method of distribution being exceptionally efficient.

The general scheme was arranged by Mr. Meunier; and it is evident that a considerable amount of preliminary designing must have been necessary to arrange such an efficient combination of up-to-date plant to so satisfactorily handle the coke and coal under somewhat difficult conditions.

MUNICIPAL ELECTRICAL ENGINEERS AND COMPETITION BY GAS.

At the Annual Convention of the Incorporated Municipal Electrical Association at Brighton last week, a discussion took place upon Street and Shop Front Lighting.

Mr. A. H. Seabrook (Chief Electrical Engineer to the Marylebone Borough Council) opened the subject of shop-front lighting. He said there was no time to go over the whole of the aspects of this problem; and he would confine himself to one which was becoming very serious—viz., the competition of high-pressure gas with electricity for shop-front lighting. In West Ham some years ago, they attempted to deal with this proposition by an inclusive hiring scheme of £2 1s. per quarter per lamp of 500 watts capacity. As a matter of fact, they made a rod for their own backs, because the gas company had since been doing the same thing all over London, with the additional trouble that they had been cutting prices. There had been a good deal of discussion as to whether the prices which the gas companies were charging were remunerative; but this had nothing to do with them. If electric supply authorities were to get business, they would have to do very much the same thing as the gas companies did. He knew that on the basis of £2 1s. per quarter, including current, maintenance, supply of lamps, and depreciation in two years, it was a remunerative business, except for the first two years—there was nothing in it till they had written-off the lamps. After this, however, there was a very handsome surplus indeed. Some time ago, he went round London to see how some districts were being affected by high-pressure gas for outside shop lighting. He went along the Barking Road, which takes in the poorer districts of West and East Ham. He was very interested to see the results there, because East Ham also had an inclusive system of so much per quarter per lamp—the charge being somewhat less than in West Ham. In the West Ham portion of the Barking Road, not a single high-pressure gas-lamp had been put up since he left there some two years ago. In East Ham, however, the whole way along, there were rows and rows of high-pressure gas-lamps. In one case in West Ham, a large grocer, in spite of his (the speaker's) "oily tongue," had been induced by the gas company to put up a large number of high-pressure gas-lamps, and had only given a corner of his shop for a few flame arc lamps, on the inclusive arc lamp scheme. But to his great satisfaction, upon his visiting the place the other day, he found that, owing to the "cart-wheel grease" which his successor (Mr. Couzens) must have applied, these lamps had disappeared, and now the grocer had arc lamps altogether. Turning over in his mind the reason why the municipality supplying lamps on this system at a high rate should get more business than an adjoining one where the tariff was lower—the same gas company being in both areas—the only conclusion he could come to was that the one had an efficient business-getting department and the other had not. They might cut their prices to ridiculously low figures; but it was much more expensive to do this than to employ an efficient business-getting department to look after the consumers and maintain prices. They could undoubtedly maintain prices by having a proper business-getting department. With regard to the prices to be charged for a lamp scheme such as the one he had already referred to, each district must suit its own local conditions. A sum of £2 1s. per quarter per lamp was all right for West Ham. In Marylebone, they had to charge considerably higher. There, they had fortunately not yet been subjected to much competition in this direction; but they were preparing for it. So far they had not found it necessary to hire-out lamps at Marylebone, as most of the shop-keepers were prepared to pay for them. He thought the following figures would be interesting as compared with gas figures. At 3½d. per unit, it was possible to supply a series of four arc lamps, giving a total of 10,000 to 11,000 candle power, at a cost to the shop-keeper of 2d. per hour per lamp, or a total cost per year for 900 burning hours of £30—*i.e.*, £7 10s. per lamp, inclusive of everything except hire of the installation and wiring. To give the same amount of light,

it would be necessary to install at least ten high-pressure gas-lamps, which, at 30s. per quarter, would give a total cost of £60 per annum. The gas people in London generally averaged about 30s. per quarter per high-pressure gas-lamp. Sometimes it was 25s., or even 20s.; but usually it was 30s. for a 1000-candle power lamp. Even adding the installation and wiring to the £30 for the electric lamps, this still beat high-pressure gas slightly in cost. A most useful lamp had recently been put upon the market—viz., a 4½-ampere direct-current flame lamp—which would enable them to considerably cut their costs and put in a flame arc lamp of more nearly the equivalent candle power of the gas-lamps. These new lamps gave a candle power of, roughly, 1200. At 3½d. per unit, they could be trimmed, supplied with current and carbons, maintained, and kept clean at a total cost not exceeding 1·35d. per hour, which meant £5 per 1200-candle power lamp for a use of 900 hours per annum, against £6 for 1000 total candle power of high-pressure gas. Mr. Haydn Harrison was going to follow him on the question of street lighting; and he wanted to nip in the bud straight away one of his ideas. Mr. Harrison had evidently in mind the joint arrangement between the gas and electric light companies in connection with the Borough of Holborn lighting; and he believed he intended to suggest that electric undertakings should keep up their shop and private lighting prices by a similar co-operation. He (the speaker) was absolutely against anything of this sort. He preferred to keep his opponent where he could see him. He had no sympathy with the sloppy, imbecile amiability with which a lot of people were inclined to regard their opponents. The gas industry was better organized than the electricity supply industry; from the commercial point of view, they were the superiors of electrical engineers. They might as well speak straight out, because there was no question about it. The gas companies' business-getting departments were superior; and electrical engineers were not sufficiently equal with their competitors to be able to play fast and loose and give them an inch in any way. They were going to get all they could; and in the present position it was safer to keep them at arm's length.

Mr. Haydn Harrison said the question of competition with gas for street lighting was getting very interesting in the matter of cost. His experience had shown him that, providing conditions were equal at the start—*i.e.*, if a town were being laid out with electric lighting and gas lighting, mains were being provided for both, and everything was in the *ab initio* stage—there was not the slightest doubt (and he did not think that even the gas people could find anything to support an argument to the contrary) electric light could give an equally good light in the streets at a much lower cost. But, of course, the conditions which they all had to face were quite different. In nearly every town where an electric undertaking had been installed during the past few years, the streets were lighted by gas, and had been lighted by gas for a very considerable time. In most cases, the street lighting had been carried out by the gas department or the gas company without any competition. They therefore had their own prices for a number of years, and they had paid off practically every penny-worth of capital in connection with it. The result was that they now had no interest and sinking fund to allot to any particular mains. On the other hand, where the electric light had been installed, in the great majority of cases loans had been refused, and the work had to be carried on out of revenue, and the whole cost was being repaid in five years. In spite of this, however, they had still been able to put in prices for the same lighting equal to those for gas. In Marylebone, but for this, they could have 50 per cent. better illumination than at present for the same charge. He then explained the details of the Westminster and Holborn lighting contracts [which have already been given at length in our columns]; pointing out that in the former only 70 arc lamps were changed over, owing to the Electric Lighting Companies unfortunately being able to agree upon their prices. In Holborn, the Council were willing to pay a price which would be remunerative both to the Gas and Electric Light Companies; and the point he argued was that lighting was practically a monopoly, in that there were only two parties to the arrangement. They knew of a lot of cases where the competition was between six, seven, or eight people; and they were able to make arrangements by which they, at any rate, made a reasonable profit. Mr. Seabrook said he would have nothing to do with any such arrangement. Was the competition to continue on the basis that the one who had the most money could last the longest? In his opinion, the work available was such that it would be to the interests of both parties to make some arrangement by which they could each do the particular part for which they were specially suited, at prices which were remunerative. He thought this was the reasonable way of looking at it. In connection with the Holborn lighting, where the Gas Company had worked in conjunction with the Electric Light Companies, it had been found that the gas managers were sound business men, doing the very best they could for their shareholders. They were perfectly straightforward; and why they should be so afraid of them, and try to hold them at arm's length, he did not know. He thought that it was a distinct sign of fear on their part more than anything else.

Mr. J. R. Dick urged the Council of the Association to take some action in regard to the attitude of the Local Government Board on the matter of loans for street lighting. At Brighton, some street electric lighting fittings had been in use for sixteen or seventeen years; and he had no doubt they would last for thirty years. He urged that, wherever a gas company were asked to tender, the electric lighting department or company should also be invited to send in a price, in order that the district might get the very best, whichever was shown to be so.

Mr. A. C. Cramb (Chief Electrical Engineer at Croydon) was in general agreement with Mr. Seabrook. The question of high-pressure gas for outside private shops was getting a very serious matter in London and the surrounding districts. He recently took the opportunity of inspecting certain thoroughfares; and in some roads where there had been a considerable number of arc lamps until a short time ago, there were now solid rows of high-pressure gas-lamps—the arc lamps having now been swept away. The reason why the high-pressure gas-lamp should be such a formidable competitor for this class of lighting was interesting. The gas companies in London, where they had attempted the thing on a large scale, liked to put in their compressor somewhere near the middle of a long street, and lay a special high-pressure main right through. The pipes were then run up outside the shops to the lanterns; and the result was that the whole of the installation was practically outside the shops, and under the control of the gas company. They went to a shop-keeper and said: "We will give you so much candle power per annum at so much cost." They generally tempted him with £5 per 1000-candle power lamp. They told the shop-keeper that he would have no trouble with mantles, no bother with lamps going out, and that they would take all the responsibilty off his shoulders and guarantee the light. He asked them to put themselves in the position of the ordinary shop-keeper—especially one who had been using arc lamps which he had bought himself, and had to trim and repair in the ordinary way. The feeling of the average user of arc lamps for outside shop lighting was that they were very fine lights when they were new; but, after two or three months, there were troubles with carbons and all sorts of things. The lamps wanted new carbons just in the middle of the busy part of the trade of the evening; and they were always going wrong. This was the general feeling. Therefore, when the gas agent came along and offered to take all these troubles and worries off his shoulders, and give a good light for a fixed amount per annum, the shop-keeper jumped at it; and he would clearly be a fool if he did not. What had the electrical authorities done in this matter? In most cases, absolutely nothing of this character at all. Even in Brighton, they were ignorant of the fact altogether; and he sincerely hoped that Mr. Christie would have a big high-pressure gas installation put down soon in competition with him. He recently had to go into this class of competition; and he went round and interviewed the shop-keepers to find out exactly what the position was. He was told in every case that, if the electric light people would supply the lamps, clean, repair, and maintain them, and take the worry off their shoulders, the shop-keepers would have electric light, as they preferred it to high-pressure gas. He lost several for this reason; and he knew that, if only they had powers to wire premises, they could keep every one of these consumers. In the London district alone, they had lost several thousand pounds' worth of business, which was going into the gas companies' pockets. If they had proper hiring and wiring powers, they need not be afraid of gas competition—especially if they had a proper sales department to look after the consumers. By these methods, they could keep their business; and he would go further, and say that it was possible, light for light, to get another £1 per lamp per annum for electric lamps as against gas, if they had a proper business organization. Gas companies were not making a big profit on this outside lighting; but they just wanted to knock the arc lamps out, and they were going as near rock-bottom as they could. Electric supply undertakings could not do it if they had to employ contractors, and pay them their 10 per cent. profit. The gas companies had cut out this profit, and they had a proper organization in which this work was done more or less in connection with street lighting. Most electric supply undertakings had fairly large street lighting departments; and they should be able to maintain and look after these outside shop lamps in the same way, but not if they were going to bring in the contractor. They could employ him to fit up the installation in special instances; but here was a case of rock-bottom competition, and they had to take out every halfpenny of expense they could. They could hold their own by adopting gas company methods; but the main difficulty was the absence of powers to do it. Almost every morning they found propositions at their offices; and they asked themselves what were they going to do. But they had no powers, and practically had to pass the business on to the gas company. This proposition might satisfy some; but it did not satisfy him, and he did not think it ought to satisfy anyone of them.

Councillor Crowther (Sheffield) regretted that there was very little street electric lighting in Sheffield, which was mainly due to the cheap price of gas. The tramway drivers, however, were asking for electric lighting to be installed, as it gave a better light, and enabled them to more easily avoid accidents. In all cities where gas was dearer than at Sheffield, the question of street lighting ought to be seriously taken in hand; but this could only be done by reducing the cost to the lowest possible point. The gas companies in the competition with electricity were certainly doing this—in fact, in some cases they were keeping the charge so low that there was no profit in the business. He strongly supported the view that all electric supply undertakings should have wiring powers.

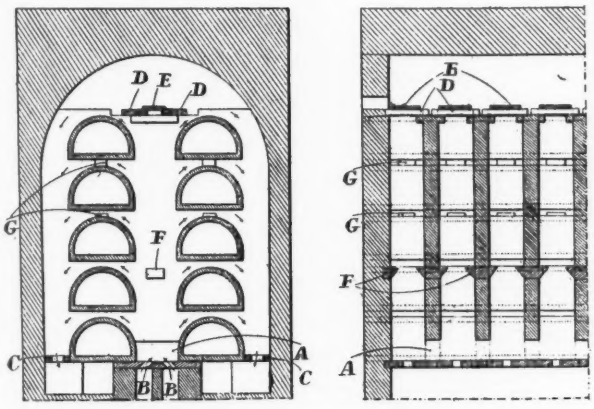
Mr. Seabrook, in the course of a brief reply, said he thought that to co-operate with the gas companies was a bigger sign of fear than keeping them at arm's length—the attitude that he would prefer to adopt.

HEATING HORIZONTAL RETORT-SETTINGS.

A patent has been taken out for France by M. Pierre-Jacques Picard for improvements in the method of heating horizontal retorts. The following particulars of the invention are translated from the French specification.

In settings which contain two vertical rows of retorts, heated by a central line of nostrils, the flames are usually distributed very irregularly. The vacant space between the retorts favours a rapid ascent of the gas and air; and the temperature is higher in the upper than in the lower part of the setting. Nearly all the combustion gases pass between the arch and the two upper retorts; the result being that the quantity of gas produced in the lower retorts is considerably less than in those above. The setting consequently does not furnish the maximum yield of gas; and, moreover, the upper retorts wear out more rapidly than the others. The temperatures of the different retorts can be altered as required by changing the proportion of the gases passing above the upper ones. For this purpose, dampers are placed between the latter and the arch of the setting, so that the size of the passage for the gas can be regulated.

The accompanying diagrams show a retort-setting constructed according to the invention.



It will be seen that the inner portion of the setting is divided into several compartments, communicating with each other through openings A. The retorts are placed in two vertical rows, and extend over the entire length of the setting. The heating gas and the hot air to promote combustion are introduced through openings B, which are parallel with the longitudinal axis of the setting. The course of the hot gases is indicated by the arrows; and they flow out through the openings C.

The invention consists in fixing dampers D above the two highest retorts, in the middle of the setting as shown, and resting upon the walls. Above the dampers is a horizontal plate E, which prevents the passage of the gases between the dampers. These are worked from the outside by means of rods (not shown in the illustrations) running through openings in the wall of the setting.

It is advantageous to have along the axis of the setting refractory brackets F supported by the walls, and on a level with one of the lower rows of retorts. They cause a thorough mixing of the gas and hot air, and thus stimulate combustion. Pieces of refractory material G, increasing in thickness from one line of retorts to another, are placed between the top of certain retorts and the bottom of the one immediately above. By means of these pieces, suitable dimensions can be given to the section of the passage for the gas between the different retorts.

The invention is not confined to the design represented in the illustrations. For instance, instead of dampers, fixed pieces, of sizes adapted for average conditions of working, can be utilized to decrease the section of the passage for the gas at the upper part of the setting.

The "Pharos" High-Pressure Light.—In the last number of the "JOURNAL," we gave some particulars of installations of high-pressure lighting by the "Pharos" system, which has been introduced by the Auer Company of Berlin. We are informed by the Welsbach Light Company, Limited, of Gray's Inn Road, King's Cross, W.C., that they have been appointed by the Auer Company sole agents for the light in the United Kingdom.

London and Southern District Junior Association.—Mr. F. W. Goodenough, Controller of the Gaslight and Coke Company's Gas Sales Department, has, as Hon. Secretary and Treasurer of the Gas Companies' Joint Exhibit Committee, kindly invited the members of the Association to the Coronation Exhibition, at Shepherd's Bush, and to tea at the Garden Club. Saturday next is the date fixed for the visit; and it is proposed that the members should assemble at 4 p.m. at the gas companies' exhibit (which is situated in the Industrial Section, Building 14, at the immediate right-hand side of the entrance to the Court of Honour); and then they will proceed to tea, at which Mr. Goodenough will preside.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

A Few Words with the Kendal Health Committee.

SIR,—Many thanks for the copy of your "JOURNAL," containing your criticism of my leaflet on "Fresh Air and Ventilation." If you will read the leaflet carefully, you will see that my object is not in any way to discourage the use of gas, but only to point out the necessity for additional ventilation when burning gas, over and above what is required when electric lights are being used, or even no lights at all. Immediately after writing the leaflet, I installed a gas-cooker in my house for the first time in my life.

As to the accuracy of my paragraphs, I believe the substance of every statement can be found in Notter and Firth's last edition of "The Principles and Practice of Hygiene." Moreover, the entire leaflet was submitted to, and heartily endorsed by, the Medical Officers of Health of three of our largest provincial cities, as well as by the County Medical Officer of Health of Westmorland, and the Medical Chairman of the Westmorland Public Health Committee.

WM. RUSHTON PARKER, M.D.,
Chairman of the Kendal Health Committee.

Kendal, June 28, 1911.

[We are pleased to learn that the object of Dr. Rushton Parker, Chairman of the Health Committee of the Kendal Corporation, "is not in any way to discourage the use of gas." It is a pity that the circular of which we made complaint last week did not indicate to the burgesses of Kendal, in a transparent manner, its exact purpose. Now as to the accuracy of the paragraphs of the circular which were reproduced in our editorial columns last week. Let it be clearly understood we do not care any more for what Messrs. Notter and Firth have to say on the subject in their last edition of the "Principles and Practice of Hygiene," nor of the endorsement of the Medical Officers of Health of three of the largest provincial cities in the country, nor of that of the Medical Officer of Health of Westmorland, nor again of that of the Medical Chairman of the Westmorland Public Health Committee, than we do of the opinions of the ladies who have contributed to the literature of the subject in the columns of the "Girl's Own Paper" and one or two other popular magazines for ladies, and who have refused afterwards to substantiate their statements. We have at hand the views of men of considerable eminence; we have the results of actual scientific tests; we have at command the experience of more than a hundred years with the use of gas in the homes of the people; and we have (it is claimed) an average amount of common sense. Now, then, we put last week a plain question to the Kendal Corporation Health Committee, or to its Chairman (Dr. Parker), based upon the statement in the circular: "When gas is lit, it takes some of the best part out of the air, and gives out *a great deal of poison*," and upon the use of the plural "poisons" in a succeeding paragraph. We asked the Health Committee or Dr. Parker to take a set of given conditions—say, an incandescent burner—and tell us in volumetric terms what is meant by "a great deal," and by names what is meant by "poisons." We ask him not to tell us what Notter and Firth say, or the Medical Officers of Health of three large provincial cities and of Westmorland, but to let us have a definite reply from off his own bat to the objectionable statement appearing in a circular for which he (we are pleased to see) takes, in the foregoing letter, full responsibility. If there is any use made of this circular, by quotation or otherwise elsewhere than in Kendal, the candid acknowledgment of authorship may prove very useful.—ED. J.G.L.]

Uses of High-Pressure Gas for Industrial Purposes.

SIR,—I beg to offer a few remarks in reply to Mr. Alfred Mansfield's letter appearing in your issue of June 27.

I regret that there has been a misunderstanding. I now know that the Mr. Mansfield referred to by Mr. Leather in Glasgow is not the Mr. Mansfield who called on me in Birmingham. I particularly stated in my reply to Mr. Leather that I had been in communication with "*a* Mr. Mansfield, of Birkenhead."

Mr. Mansfield states that I endeavoured to crystallize the results of my experiments into definite statements of fact. If Mr. Mansfield will be good enough to re-read the opening paragraphs of my paper, he will realize that my attitude towards the subject is not in agreement with his statement.

I can hardly think the criticism in the last paragraph of Mr. Alfred Mansfield's letter is intended to be taken seriously. Assuming that it is meant seriously, Mr. Mansfield will be relieved to learn that all volumes of gas mentioned in my paper are reduced to a pressure of 20-10ths water-gauge.

In accordance with the suggestion made during the discussion of the paper in Glasgow, I hope to add considerably to the information the paper contains, before the "Transactions" are made up, and I will take the opportunity of replying fully to the points raised in the discussion.

E. W. SMITH.

High-Pressure Gas Laboratory, Birmingham, June 28, 1911.

SIR,—Scarcity of time prevented me commenting upon the two contributions by Mr. E. W. Smith to the Institution meeting, and consequently I shall be glad if he will explain, through the medium of the Press, some of his statements, by giving further information on the

points I raise, because my practical experiences do not confirm his conclusions. The actual user or customer of gas is not the least person I have to study when supplying gas in the city and suburbs of Glasgow; and so I should like to know why, in the report of the Gas-Heating Research Committee, by Mr. Smith, "It should be possible to have a burner and nipple so adjustable that it will give a flame with a given consumption which is so well aerated that it will light-back at either 5-10ths or 30-10ths pressures, and at the same time, by cutting-down the aeration, give a luminous flame. Only the burner and nipple which are capable of such a range have a right to claim the capability of being used between these pressures." I have always considered it altogether wrong to have a gas-fire burner so adjustable that it would light-back at any one or two pressures, such as is put upon the supply entering most consumers' houses to-day. The gas-fire of the future must not on any account—with fair usage such as it is likely to get in daily use—light-back at all. Many a fire is in position, lying idle, that would be more often in use but for the fact that "the horrid thing" will not burn right every time when required. The consumer requires a simple method of controlling his fire; and the very best way is to regulate it by the tap on the supply-pipe. It is so simple that a child can work it. Nevertheless it is really necessary that the burner, which embraces the injector, should, under all useful control, give uniform flames, and without producing any unpleasant noise. My experience does not coincide with much that is stated in the portion of the report which comes soon after my quotation. But I may be wrong.

Then, passing on to the tests of burners, Mr. Smith would greatly oblige by defining what he considers a "correct flame." Figures do not assist one in this matter when the results of aeration differ so greatly that the correct bunsen flame of burner "B" was represented by "0·2912," and "C" by "0·3083;" and yet burner "A," with an objectionable noisy flame, gave "0·2969" as its figure. The action of a steam-injector cannot be compared with that of a gas-injector. The case is not at all parallel in effect as I understand it.

Coming to Mr. Smith's paper on "The Uses of High-Pressure Gas for Industrial Heating Purposes," I am constrained to differ from him over the comparative tests given in the paper. Test No. 1, with high-pressure gas for water-heating, is shown to yield an efficiency of 92 per cent. From the data given, I can only make it 62 per cent. to the nearest round figure. In test No. 2, using low-pressure gas, the efficiency is about 16 per cent. too low. I may be wrong, but I shall be glad if Mr. Smith will show me where I have gone astray. In matters of gas efficiency and economy one has to be exceedingly careful, when making comparative tests or trials, to see that "other things" are the same. This Mr. Smith has overlooked; for in the one case the water was raised from 15° C. to 100° C., and in the other from 12° C. to 99° C. Further, one sample of gas is measured at 15 inches mercury, and the other at 25-10ths water-column pressure. Surely such tests cannot be said to be "parallel tests." I have, as nearly as is necessary, corrected to 20-10ths inch pressure; but I cannot duly allow for errors due to temperature differences. I would suggest to Mr. Smith that comparisons of this sort necessitate that the water temperature should be confined to some degree short of boiling; for it is practically impossible, when making tests on the value of a fuel, to determine accurately the boiling-point of water, as I think he must be aware. I would suggest 70° C., or 150° Fahr., as a maximum temperature to which to raise the water.

The following tests were made with low-pressure coal gas some years ago; and although I have many higher results, I have chosen two that represent the same quality of gas, and one of a poorer quality than Mr. Smith used. I believe they will suffice to show that Mr. Smith's high-pressure test of barely 62 per cent. efficiency can easily be passed by low-pressure gas:—

Date, 1904.	Rate Per Hour.	Time to Raise 1 Litre 100° F.	Corrected Cub. Ft. Used.	Total Heat Utilized.	Total Net Heating Value of Gas.	Heat Utilized.
	Cub. Ft.	Min. Sec.		B.Th.U.	B.Th.U.	Per Cent.
Jan. .	10	3 52	·6440	342·0	540	63·3
Feb. .	10	3 50	·6461	341·1	543	62·8
,, .	10	4 16	·7120	309·5	485	63·8
						63·3

One word further anent gas volumes. When experimenting, I usually ask myself this question: "How is the gas measured and charged for by the user?" The answer usually is: "Normal conditions of supply." Now, this is subject to about 20-10ths water column pressure, and not 15 inches of mercury. Temperature and barometric variations are never considered, unless the conditions are abnormal. But this is certain—the index-reader knows or cares little for anything but the position of the "hands of the dial." Therefore our corrections must tally with custom and practice. I am afraid Mr. Smith's tests of governors have necessitated a labour of love. I do not wish to discourage him, but my experience of them (which embraces their use up to 10 atmospheres) is that he is looking for the impossible; while the "pressure jet" is likely to deceive him as a measurer. I am anxious to be convinced that, with gas at (say) 2s. per 1000 cubic feet, a halfpenny worth, or 20·8 cubic feet, under high pressure will or can do as much work as 3d. worth, or 124·5 cubic feet, subject to prevailing district pressures, as cited in the paper. Really, if 11,273 B.Th.U. net of gas can do as much work under a certain condition as 67,638 of such units of heat under another yet to hand serviceable one, then the gas industry is in for something I fail to find words to define.

The whole paper is so full of interest to me that I hope Mr. Smith will excuse my criticisms, as I assure him I have only the best interests of the gas industry at heart.

WALTER GRAFTON.

Glasgow Corporation Gas Department,
June 29, 1911.

SIR,—On reading the reports of the papers presented to the Institution at the recent meeting in Glasgow, I was astonished to notice the enormous saving in gas (claimed by Mr. Smith) on substituting high-pressure gas for low-pressure gas, worked in conjunction with an air-blast, for melting gold.

On p. 890 of your issue of June 20 is given a table—a summary of the results of tests carried out "to determine the relative costs of melting gold in 100 oz. lots, with coke, air-blast and gas, and high-pressure gas, and then reducing it from 18 carat to 9 carat by alloying the gold in the usual way with silver, copper, and composition."

There are one or two points in this table which call for comment and explanation.

In the first place, it is stated that the operations lasted an hour, an hour-and-a-half, and half-an-hour respectively. Why is it necessary to charge a higher rate for labour in the case of the test with air-blast and gas?

Disregarding the series of experiments with coke as the fuel, and considering the cases of the gas-fired furnaces, it is to be noted that in the one case the cost of gas is given as 3d., and in the other as ½d. Now presuming that the same prices are charged for coal gas supplied at high and low pressure, the figures given by Mr. Smith mean that the system of heating by high-pressure gas is six times as efficient as that in which an air-blast and low-pressure gas are employed. Surely this is a somewhat extravagant claim?

It is to be expected that by using high-pressure gas in place of low-pressure gas in a form of bunsen burner, an increase in the efficiency of the heating process would result. The greater expansion of the gas in the first case on escaping from the burner-nipple causes sufficient air to be drawn along to allow of complete combustion without the necessity of any secondary air, whereas with the gas at low pressure secondary air is necessary for complete combustion. The volume of flame would be smaller for the same gas consumption in the first case; and in consequence there would be a hotter flame-zone produced. With air-blast and low-pressure gas, however, it would not be difficult to arrange for the admission of sufficient air to ensure complete combustion and to obtain proper mixing before ignition; so that it is difficult to see how high-pressure gas-heating in the case under consideration can be much more efficient than low-pressure gas properly worked in conjunction with an air-blast.

An advantage in the use of high-pressure gas would be that but one set of pipes would be necessary as against two in the other case; so that the cost of the installation would be less, and, in addition, the gas company could compress the gas more cheaply than the average consumer could compress air.

The 92 per cent. efficiency claimed by Mr. Smith in his iron-pot experiment induced me to calculate how much of the energy available in the gas had been transferred to the gold in the above tests.

The figures published with regard to these tests leave us in the dark on many points; so that I have been forced to make certain assumptions as to his working conditions. These assumptions are quite reasonable, I think, taking into account the data given. The assumptions made are—

1. That the metal used was pure gold, and that in no case was it alloyed with any other metal.
2. That the metal was raised to a temperature of 50° C. above its melting-point before the gas was turned off.
3. That the charge made for gas was 1s. 8d. per 1000 cubic feet.

The following calculation shows how much heat was transferred to the gold:

1 oz. troy = 31 grammes.
100 oz. = 3·1 kilogrammes.
Specific heat of gold = 0·032 calorie per gm. = 0·032 K.C.U. per kg. (ca. 0·128 B.Th.U.).
Melting-point of gold = 1063° C., say 1050° C. above the temperature of the room.
Latent heat of fusion of gold = 16·3 calories per gm. = 16·3 K.C.U. per kg.
∴ Heat required to raise the temperature of the gold through 1050° C., then to melt it, and further to raise its temperature through 50° C.

$$= (0{\cdot}032 \times 1100 \times 3{\cdot}1) + (16{\cdot}3 \times 3{\cdot}1)$$
$$= (35{\cdot}2 \times 3{\cdot}1) + (16{\cdot}3 \times 3{\cdot}1)$$
$$= 51{\cdot}5 \times 3{\cdot}1$$
$$= 159{\cdot}6 \text{ K.C.U.}$$

That is to say, about 160 K.C.U. (640 B.Th.U.) are required.

Now if the gas costs 1s. 8d. per 1000 cubic feet, then for ½d. one would obtain 25 cubic feet.

The net calorific value of the gas is given by Mr. Smith in the iron-pot experiment (p. 885) as being 542 B.Th.U. per cubic foot; and that value is taken here. 542 B.Th.U. is about equal to 135 K.C.U.

Therefore the heat available on the combustion of 25 cubic feet of the gas

$$= 25 \times 135 = 3375 \text{ K.C.U.}$$

Of this energy, 160 K.C.U. are employed in melting the gold.

$$i.e.\ \frac{160}{3375} \times 100 = 4{\cdot}7 \text{ per cent.}$$

Only 4·7 per cent. of the heat available is transmitted to the gold. [This process is evidently not one in which a 90 per cent. efficiency is to be looked for.]

Now according to Mr. Smith, with air-blast and low-pressure gas, the cost of fuel was 3d.; so that six times as much gas must have been employed. In that case, something like 0·8 per cent. of the heat available was transmitted to the gold. Is this the best that makers of furnaces for use with low-pressure gas can do? Would Mr. Smith give full details concerning these tests, so that it may be seen that the best possible methods of applying the systems of heating have been adopted in each case?

In the same paper, on "The Uses of High-Pressure Gas for Industrial Purposes," Mr. Smith says: "Another field in which high-pressure gas has an advantage over low-pressure . . . is in the heating of liquids." In support of this, he cites two tests in which water was heated in an iron pot from the temperature of the atmosphere to the boiling point. The conditions under which the experiments were made are unfavourable for heating by low-pressure gas, and the tests appear to me to be worthless. No mention is made of the size and weight of

the iron pot, nor are many details given of the method of lagging the pot and reducing heat losses. Further, one would like to know how the gas consumptions were determined, and why the rate at which gas was burnt in the case of the low-pressure experiment was considerably less than that in the case of the high-pressure experiment? Does Mr. Smith wish to persuade the general public that 47·5 per cent. represents the best efficiency that can be obtained with low-pressure gas when used for water heating?

In a report of the discussion on his paper, Mr. Smith is quoted as having said: "The better the mixture of gas and air, the higher the initial temperature of combustion, and the greater the combustion radiation; . . . and he quite agreed . . . . that the larger the flame the greater its temperature." [*Vide* "JOURNAL," June 20, p. 892.] I should like to ask Mr. Smith what he means by the phrase "initial temperature of combustion?" By "combustion radiation," it is to be presumed that he means the energy radiated as the result of combustion taking place? The energy thus radiated is very largely in the form of heat; and it is certainly not increased by mixing the gas with air before ignition. The percentage of the total energy emitted as heat radiation is greatest when no air is mixed with the gas before ignition, as will be seen from the following results obtained by Professor Callendar.*

Total Radiation of Mèker Burner per Cent. of Heat of Combustion.

Total radiation per cent. . .	10·5, 12·3, 14·0, 15·9, 14·1, 14·6, 17·0
Ratio of air to gas by volume .	5·0, 4·0, 3·0, 2·5, 1·5, 1·0, 0·0

The gas was in all cases completely burnt. The ratio of gas to air before ignition merely describes the nature of the flame.

If Mr. Smith's second statement were correct, then it would follow that the bunsen flame is a cooler flame than the luminous flame obtained by shutting off the primary air. This is not the case.

There may be a great future before high-pressure gas; but extravagant statements of the nature of those made by Mr. Smith will tend to concentrate criticism on the system when it is least able to bear such criticism with equanimity.

10, *Eldon Place, Leeds, June* 28, 1911. HAROLD HARTLEY.

Glover-West Vertical Retorts at Manchester.

SIR,—In answer to requests from your readers, I beg to forward particulars of the temperatures in the combustion chambers of the Droylsden installation of Glover-West vertical retorts, together with other useful information.

Temperatures in Combustion Chambers.

		Degrees Fahr. Left Hand.		Right Hand.
Top combustion chamber	No. 6 . .	2460	..	2460
,, ,, ,,	No. 5 . .	2400	..	2400
,, ,, ,,	No. 4 . .	2400	..	2400
,, ,, ,,	No. 3 . .	2460	..	2460
,, ,, ,,	No. 2 . .	2500	..	2500
Bottom combustion chamber	No. 1 . .	2500	..	2450

Circulating chambers, 1600° Fahr. at inlets.

Producer gas contains an average of 22 to 23 per cent. of CO.

Waste gases contain an average of 18 per cent. of CO_2.

Pull on the waste-gas flue equals 2-10ths at the bottom, where the waste gas enters the chimney, decreasing to nothing at the top.

Pull at the primary-air inlet equals 2·5-10ths.

Chimney gives 7-10ths pull.

Manchester, June 29, 1911. J. G. NEWBIGGING.

Scientific v. Unscientific Carbonization.

SIR,—The three valuable papers mainly dealing with vertical retort carbonization were somewhat shorn of interest by the few (preventing the many) discussing them, and also in the curtailment of time for the authors to respond.

In the readers of the papers there was apparent "light treading," and each one evidently expected his story would be different. In that they were all not mistaken, for the meeting was left as far removed from anything else except "a few ideas in the melting pot," the same as ten years ago.

The race to obtain the prize results from a ton of coal has now begun in earnest, although the starter's pistol cracked more than a hundred years ago. From that time it has rested upon the heads of the gas engineering profession, who have been guilty—in the largest way—of extravagance in wasting our (now) precious coal supplies.

If any proof is necessary, it remains in the fact that the scientific way to distil or carbonize coal has at last been discovered, in that it is now possible to get from a ton of coal 20 to 30 per cent. increased volume of gas actually carrying the same illuminating value, and better heating value, than was ever known before—to say nothing whatever about the residuals.

The old "ten-thousand-to-the-ton" men have either disappeared altogether, or have had their mouths closed by the "vertical position men."

This country at least has taken unscientific carbonization of coal "lying down" quite long enough.

I do claim a great effort, and an enormous amount of work, to remedy this great waste of our pent-up light and energy—now so precious to us. And glad as I am to see Manchester, Sunderland, and other places doing so well, I hold confirmed records equally as good obtained at Exeter by continuous carbonization nearly ten years ago.

Exeter, June 30, 1911. T. SETTLE.

* See British Association, Section G, Sheffield, Third Report of the Committee on Gaseous Explosions.

Corrosion of Service-Pipes.

SIR,—In reply to the note in your last issue by Mr. Hole, I have to say that "acidiferous subsoil" can have only one meaning to my mind, and I believe to the minds of most people; and I believe I might define that meaning as a subsoil which is in itself or contains in itself substances which are acid in character and which will give an acid reaction when partially dissolved in water. Granting this definition to be true for practical purposes, surely it is impossible to regard the corrosion of services which admittedly takes place in a forced soil containing ashes, &c., as due to an "acidiferous subsoil," if such subsoil is not acidiferous but alkaline; and so far as I have examined such subsoils, they have been invariably alkaline and not acidiferous. I, therefore, reaffirm what I stated in my notes.

Greenock, June 28, 1911. JAMES MCLEOD.

Publicity and Sales of Gas.

SIR,—Mr. Humphrys' article and your leader in this week's issue make one feel that the Publicity Committee has not been formed a moment too soon; for I am quite sure that, in these days of competition, Mr. Humphrys will find very few in agreement with him that "a dignified silence is preferable."

It would be a serious mistake to allow hostile statements to be made publicly and give no contradiction; and this is one of the principal reasons why the Publicity Committee has been formed. The objects of the Committee will be not only to controvert false statements, but to educate the public to a true appreciation of the uses of gas—not only as a light but for cooking, heating, and power purposes. And this can only be done by the whole gas industry uniting and supporting the Committee, financially and otherwise, in their work.

It is to be hoped that the Committee will lose no time in getting to work and justifying their existence, not only to their supporters but to those who are at present either "sitting on the fence" or out of sympathy with the movement.

Aldershot, June 29, 1911. R. W. EDWARDS.

Maintaining a Constant Draught in Main Flues.

SIR,—The remarks on the papers read before the recent meeting of the Institution of Gas Engineers, having reference to the advisability of maintaining a constant draught in the main flue of retort-benches, naturally raise the question as to the best means of accomplishment. A governor, to maintain a constant vacuum irrespective of the chimney pull, would seem to meet all requirements. Has such an apparatus been successfully applied?

It would also appear to be a good solution to a chimney which fluctuates considerably—due to local aspects, from a geographical point of view.

June 26, 1911. CONSTANCY.

Belfast Gas-Works Results.—The report on the working of the Belfast gas undertaking for the year to March 31 last shows a gross profit on the manufacture and sale of gas and residuals of £64,568, which is an increase of £13,490 over last year.

Fish Poisoned by Tar.—A considerable area of the main road in the Kirkby Stephen district was recently tarred to settle the dust; but the drenching rain of a few days ago washed the tar into the River Eden, where numbers of trout have been found poisoned. Concern is felt by the farmers who live on the banks of the Eden lest their cattle should also be poisoned. The Westmoreland County Council, who are the authority for preventing the pollution of rivers, thus find themselves in the curious position of being chargeable with this offence within their own area.

Birmingham Gas Department Figures.—We have received from Mr. Thomas H. Clare, the City Treasurer of Birmingham, a copy of the detailed accounts prepared for the twelve months to March 31. Those relating to the Gas Department furnish some figures in addition to the ones which were given in the "JOURNAL" for May 16 (p. 467). The revenue account shows a balance of income in excess of expenditure of £211,754 for 1910-11, carried to profit and loss account. After providing for annuities, interest, and redemption of debt, the balance of the profit and loss account was £75,621. The amount of capital expended during the year was £30,744; and the value of buildings and plant abandoned, &c., was £63,250. The total expenditure on capital account to March 31 was £2,428,461. The amount of the reserve fund provided out of revenue, with accumulations, was £100,000; while the gross total of loans negotiated, including annuities, was £2,908,949. The amount provided from revenue for redemption of debt during 1910-11 was £57,983; and the gross amount provided for redemption of debt to the end of the year was £982,911. The balance of loans remaining to be provided for was £1,926,038.

A Recording Gas-Calorimeter as an Aid to the Detection of Crime.—Mr. Brearley writes: Between the hours of 6 p.m. on Monday last (June 26) and 7 a.m. on Tuesday morning, the offices of the Longwood Gas Company were burglariously entered. A plate-glass window at the rear of the premises was broken, enabling the offender to open the catch which is fixed on the sash of the window. In a room adjoining, the Company have a continuously recording calorimeter in operation. Between this room and the damaged window is a door, which was open at the time. When the offender pulled down the top portion of the window, the draught extinguished the flame of the calorimeter—causing the pointer which marks the chart to at once move towards the zero line. This clearly indicated that the premises were entered at 10.40 p.m. Although some damage was done to one of the desks in an attempt to break open the drawers, the work of the office-breaker appears to have been disturbed. About this time one of the employees of the Company walked over a weighing machine situated in close proximity; and this apparently caused the intruder to beat a hasty retreat, before his nefarious designs fructified. Although no arrest in connection with the matter has yet been made, the field of inquiry is narrowed down by the effect produced on the chart by the calorimeter.

REGISTER OF PATENTS.

Coin-Freed Mechanism.

HIBBERD, C. E., of Victoria Street, Westminster.

No. 10,287 ; April 27, 1910.

This invention relates to coin-freed mechanism more particularly as applied to prepayment meters of the kind described in patent No. 14,758 of 1909.

The particular objects of the invention are to provide mechanism rendering capable the use of a smaller number of parts, or parts which are less delicate or capable of derangement—more especially in multi-coin prepayment mechanism. A further object of the invention is to provide means for controlling delivery to a prepayment meter.

Broadly, the invention consists in providing a third movable member to co-act with the two-leaf or equivalent elements referred to in the 1909 patent, normally free of same, but locked thereto on the insertion of a coin unlocking the coinholder. The leaves, upon a slight motion of the operating handle after such insertion, positively connect (as by a bolt) to the commodity controlling wheel or other device, but are positively disconnected upon further motion of the operating handle after the arrest of the leaf-like members by contact of a part of the rearward of them (or of the coin held between them) with a stop member from the commodity controlling means, as by a cam-pin or equivalent means carried on the forward leaf co-acting with the connecting bolt.

A further feature of the invention is an improved valve element particularly applicable to a coin-freed gas-meter in which means are provided automatically ensuring a gas-tight closure of the bearings or the equivalent parts through which moving members of the valve-operating means (or of the valve) enter the gas-duct. In one form, this valve consists of a box-like element having inlet and outlet orifices connected in the gas-main, and a shaft passing out of the box and carrying outside it an arm provided with a notch adapted to co-act with the operating member, such as a slidable collar, and carrying a counterpoise member. Inside the box, the shaft is provided with an arm projecting from it and carrying pivotally a conical valve plug adapted, upon partial rotation of the shaft, to effect the closure of one of the orifices referred to, which is provided with a valve-seat—by-preference, a leather or cork washer suitably treated to prevent deterioration on long standing. The shaft has only one bearing in the casing, and has its other in a spring member attached to the casing and normally tending to press the shaft longitudinally out of same. The bearing in the casing is preferably coned on the inside, and co-acts with a conical shoulder upon the shaft inside the casing. These parts are normally pressed together by the spring. The counterpoise on the external valve-arm, to open the valve, is provided in order that jarring of the meter, when the slidable member of the commodity controlling shaft has passed from the notch, shall not close the valve, and thus place the valve-arm in such a position that the slidable member will on return foul same and be unable properly to reach its limit of travel.

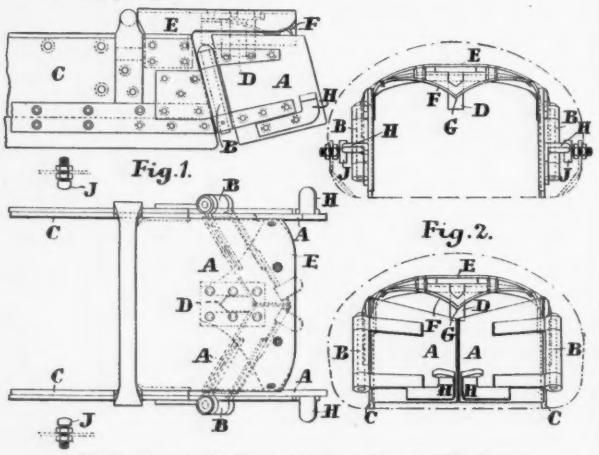
Discharging Coke from and Charging Coal into Gas-Retorts.

ALDRIDGE, J. G. W., of Victoria Street, and M'MINN, A. C., Jun., of Fulham, S.W.

No. 13,322 ; June 1, 1910.

This invention relates to apparatus that discharges and charges simultaneously through gas-retorts, consisting of two stiff or jointed side-pieces held together by distance-pieces, and having swing push-plates adapted to push the coal from a movable bed-plate outside the retort directly on to and along the bottom of the retort, while the front end is pushing out the coke—the coal being automatically supplied to the bed-plate in the desired quantity as the charger advances into the retort. The constructions referred to are described in the Fiddes-Aldridge patents.

The present invention has for its object an improved arrangement of the front push-plate of the charger so that it shall not bear on the coal and the coal be levelled as the discharging-charger is being withdrawn. It consists in pivoting the plates on a vertical pivot, so that they swing horizontally, and in providing an arched hood at the front, to which the levelling plough is secured.



A Modification of the Fiddes-Aldridge Charger-Discharger.

Fig. 1 is a side elevation and plan of a part of a charger fitted with the improved push-plate. Fig. 2 is a front view showing the swinging plates open and shut.

The front push-plate is formed of two plates or doors A, pivoted by hinges B to the side plates C, the hinges lying in the planes of the side plates and being inclined backwards in these planes at an angle from the vertical preferably of about 15°. The doors when swung inwards meet and abut at an angle considerably out of the straight line against a stop D fixed to the arched hood E, as shown by dotted lines.

The hood extends from the front of the discharging charger some distance in the rear of the closed position of the doors. On its front end, it carries a coal-spreader F, consisting of a plate riveted to the underside of the hood and bent down in the middle to form a coal-spreading edge or plough G, which pushes the coal from the middle towards the sides of the retort.

On the outside of each door is bolted a bracket H, projecting beyond the side of the charger when the doors are open, so that as the charger is withdrawn from the retort with the doors opened by the resistance of the coal, the brackets come in contact with tappet bolts J, attached to the movable apron plate of the machine, and knock the doors over their dead-centre, when they close by their own weight, owing to their being hung at an angle.

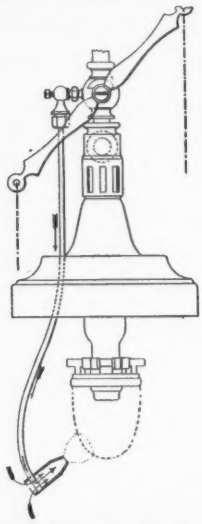
The discharging-charger can be entirely filled with coal, the whole of which is left in the retort as the apparatus is withdrawn ; "there being no obstruction of any sort tending to draw the coal back after the discharging-charger."

Incandescent Gas-Burners.

WIGLEY, P, of Olton, Warwickshire.

No. 14,144 ; June 11, 1910.

The patentee claims the combination and employment with an inverted incandescent gas-burner and its mantle, of one or more small external pilot bunsen burners and means for controlling the gas supply to them—all so arranged that the flame of the pilot bunsen burners impinges on the exterior of the mantle when the bunsen flame inside the mantle is turned off—thus providing "simple and efficient means whereby an incandescent burner can be caused to give either its full light or any desired light less than the full ; the proper gaseous mixture being obtained under all these conditions."



Wigley's Incandescent Burner with "Glimmer" Light.

The patentee provides outside of, and adjacent to, the mantle a small pilot bunsen burner fed with gas from the pipe which feeds the main bunsen. This pilot bunsen is so arranged that the flame from it impinges on the outside of the mantle and illuminates a portion of it when the supply to the main burner is turned out. Thus, when the burner is constructed as shown, either the full light can be obtained or a reduced incandescent light formed by the flame from the pilot bunsen impinging on a small portion of the exterior surface of the incandescent mantle.

Gas Heating-Stoves.

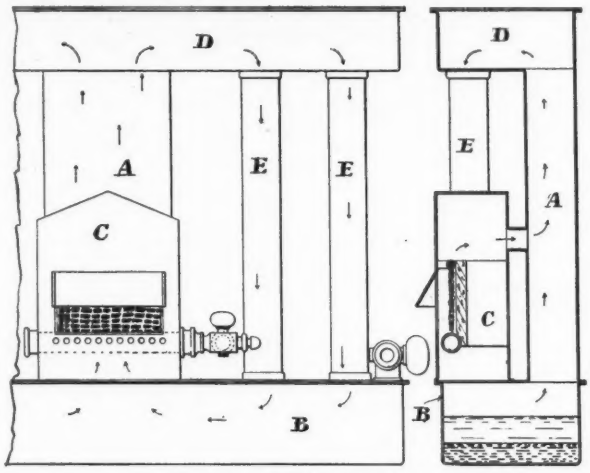
WILDE, P. R., of Bath.

No. 15,411 ; June 27, 1910.

This invention, according to the patentee, relates to "a method of and means whereby a fire can be burned without the provision of any outlet for the fumes, because the draught necessary to support combustion is obtained by a method which differs from any known methods." In order to produce the necessary draught, he makes use of the natural law that when gases are suddenly condensed within a closed receiver a vacuum or negative pressure is produced. This negative pressure causes a strong suction action at the point of entrance to the receiver which is occupied by the flue-pipe of the stove. By arranging for this negative pressure to act continuously, by a continuous rapid condensation, a draught is obtained by which the combustion of the fire is maintained and the fumes are drawn into the closed receiver. The complete condensation and transformation of all the products of combustion are effected by causing them, without again passing through the fire, to move in a circle or continuously to circulate, during which time they are repeatedly exposed to the conditions that cause their destruction, and for so long a time as is necessary to complete their entire transformation.

As shown, a vertical flue-pipe A communicates at its lower extremity with a closed tank B below the level of the stove proper or burner

part C and adapted to be partially filled with water containing an excess of undissolved lime or other reagent capable of combining with the carbonic acid or the sulphur or other compounds in the products of combustion. The upper extremity of the flue-pipe communicates with a closed chamber D, which is also in communication with the free space in the lower tank by (preferably) four tubes E. The burner part C comprises an atmospheric burner held in position within a casing, and above which depends an asbestos curtain, the heat from which, and also the flame, is deflected by a brick or other backing. The curtain is preferably of a comparatively thin section, in order to prevent undue absorption of heat and also to allow a ready radiation thereof. A canopy or shield of mica is provided, to prevent any odour of burning matter escaping from the front of the burner.



Wilde's Condensing Gas-Stove.

The products of combustion and hot air will, on admission to the vertical pipe A, ascend and enter the upper chamber D, and in doing so will create a draught, which will cause the air in the lower tank B to pass up the pipe A. The removal of air from the tank B causes a downward draught in the tubes E connecting the two tanks. Then is established a circulation of hot air, which passes by the flue-pipe A to the upper chamber D; from the upper chamber D to the lower tank B; and so on. The fumes, in passing from the lower tank to the upper chamber, meet the hot fumes as they come from the burner and cause rapid condensation, because the fumes rising from the lower tank are comparatively cool. The carbonic acid combines with the lime in the water and allows free lime to be dissolved in it in readiness to unite with the further supplies of carbonic acid; and the carbonic acid absorbed by the water causes the deposited carbonate of lime to be redissolved as bicarbonate of lime. The sulphuric acid will also be dissolved by the water. The water which is formed by the act of combustion will, by condensation, be able to be used again and again.

Inserting Valves in Gas-Mains under Pressure.

Ruscoe, A. O., of Queen Anne's Chambers, S.W.

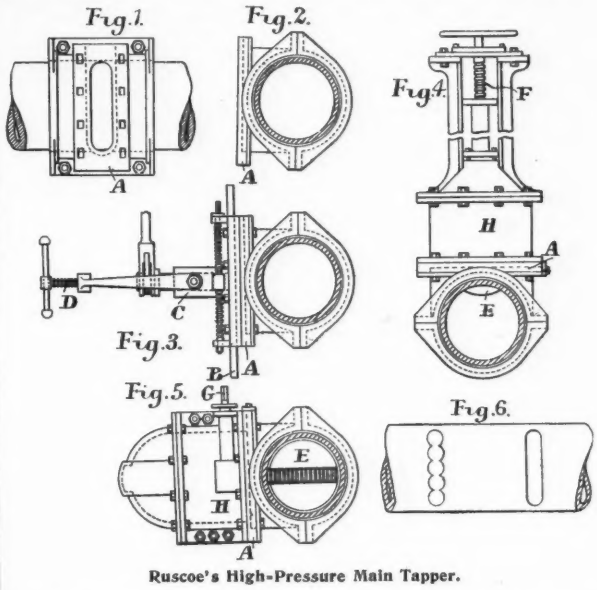
No. 14,458; June 15, 1910.

This invention relates to the insertion of valves in pipes containing gas under pressure, and has for object to enable the work of cutting the main or pipe and fixing the valve to be accomplished without any great loss of gas or interference with the supply until the actual moment when the valve is closed. The invention is further that such a valve, if its use be not further desired, can be removed while still under pressure and the cut in the pipe closed up without any great loss of gas. The valve so removed can be utilized at some other place, or can be subsequently used at the point from which it was removed. The cutting of the pipe and the fixing of the valve in position ready for use are divided for the purposes of description into three operations, described with reference to the accompanying illustration.

Figs. 1 and 2 are a plan and side or end elevation of two half-clips which form the sleeve employed to carry, first, the drilling and reamering machine and, finally, the valve and its mounting and operating gear. Fig. 3 shows mechanism employable as a drilling machine and as a reamering machine; being mounted on one of the half-clips of the sleeve. Figs. 4 and 5 show valves and valve casings mounted on one of the half-clips of the sleeve; the former being of the vertical screw-type and the latter the internal rack-and-pinion type. Fig. 6 shows, at the left-hand portion, holes drilled in and across the pipe during the first part of the second operation (the holes touching or breaking into one another), and, at the right-hand portion, the slot or cut formed in the main or pipe at the end of the second operation, and made by reamering or machining the rough or serrated edges of the holes. The edges of the slot form seatings for the valve when in its closed attitude.

After a description of the sleeve and the valve-box and damper-valve (the first division of the invention), the patentee proceeds to the second part, which relates to the drilling of the holes and the reamering of the slot or cut in the main.

The base-plate of the drilling and reamering machine is mounted on the valve-box A, and is secured to it by bolts. The plate is slotted to allow of the action of the drills and reamers on the pipe, and is also adapted to permit the traverse, in a direction transverse to the axis of the pipe, of a carriage B carrying the drill and reamer driving means. The traverse of the carriage is effected by a screw mounted at its ends in uprights on the base-plate and engaging a nut in the carriage. C is a strong upright boss mounted on the carriage B, and bored through to receive the drill or reamer spindle which passes through a stuffing-box at the upper end of the boss. The carriage is of such length that when the drill or reamer spindle is at one or other end of the diameter of the pipe, the slot is wholly covered by the carriage, and gas cannot escape to the atmosphere. The spindle is well fitted to the bore of the boss C, and is adapted to be driven by a ratchet brace, or by gearing. The feed of the drill is effected by the feeding screw D, which is supported and brought into position by a bridle pivoted to the boss C.



Ruscoe's High-Pressure Main Tapper.

The drilling machine is employed solely in the drilling of a series of holes in the one-half of the main to allow of the formation of a slot or cut of the right size; and on the completion of the holes, the drill spindle and drill are moved outward clear of them, and also of the damper-valve, which is pushed inward of the valve-box A, so as to shut off the interior of the main from it. When the damper-valve is closed, the drill spindle and drill are wholly withdrawn from the bore of the boss, the drill is removed and replaced by a parallel reamer, the head of which fits the spindle as did the drill-head. The spindle and reamer are now passed into the bore of the boss, up to the upper face of the damper-valve; care being taken to see that the centre of the reamer is true with the centre of one of the holes that have been drilled. The damper-valve is now moved outward of the valve-box, and the reamer is forced into the hole with which it is concentric until its inward end is level with the centre of the pipe. The reamer is now set in rotation by the ratchet brace or gearing, and is at the same time traversed from one side of the pipe to the other. Owing to the compound movement of the reamer, the rough edges formed by the breaking of the holes into one another are removed, and there is formed a slot, the edges of which are perfectly smooth. When the reamering has been completed, the damper-valve is moved inward, so as to permit of the complete withdrawal of the spindle and reamer and also of the disconnection of the drilling and reamering machine from the valve-box.

The third part consists of the fixing of the valve in position. The valve or valve-gate E is of a thickness in conformity with the diameter of the drill and reamer. In fig. 4, it is operated by the screw F and hand wheel, the screw engaging in a tapped hollow spindle, secured to the valve-gate. In fig. 5, the gate E has a rack cast on it engaged by a pinion operated by a spindle G. The valve-gate is lined on its periphery, and on each side that fits in the slot, with compressible material compressed after contact has been reached on the interior of the pipe and on the sides of the slot.

The valve boss or cover H is bolted on to the top of the valve-box A in exactly the same manner as is the drilling and reamering machine. The cover is of sufficient length to permit of the complete withdrawal of the valve-gate E from within the main or pipe. When it is bolted on to the valve-box, the damper-valve is withdrawn so as to permit the valve-gate to be moved into position across the pipe; and when this has been done, the damper-valve can be completely withdrawn from the valve-box and the slot in the end of it closed, as already described.

Washing Coke and Coal.

Benson, R. S., of Middleton St. George, Durham, and Head, Wrightson, and Co., Limited, of Thornaby-on-Tees.

No. 24,268; Oct. 19, 1910.

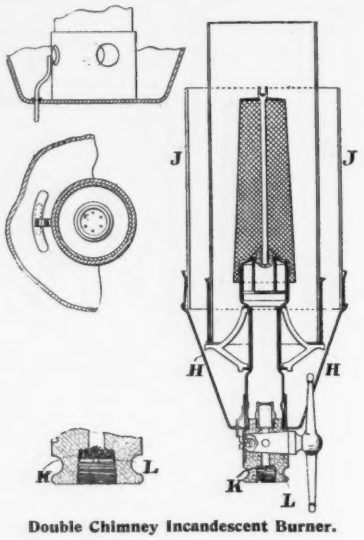
This invention relates to a machine which "will treat a maximum quantity of coal at a minimum cost, and which is of simple construction and has a minimum of parts subject to wear and tear." This end is said to be attained by a construction which comprises essentially a tank, a compartment in the tank—a "wash-box" having an inclined perforated bed or bottom at a distance above the bottom of the tank, an adjustable sill across the deeper end of the wash-box, two upwardly inclined shoots at the deeper end of the wash-box and arranged one above the other (the inclination of the shoots being greater at the end next to the wash-box than that at the other end), a feed for the unwashed coal above the shallow end of the wash-box, a water supply leading into the tank (preferably behind the wash-box), and a "Marcus" propeller gear, as described in patent No. 14,412 of 1900, for imparting to the tank and parts carried by it what is known as the "Marcus" motion.

Gas-Mantles Incandesced with a Diminished Consumption of Gas.

STORER, J., of Hawthorn, Victoria, and WITT, G. C. DE, of Melbourne.

No. 19,606; Aug. 22, 1910.

This invention relates to means for "obtaining perfect incandescence of gas-mantles with a greatly diminished consumption of gas," by the arrangement shown.



Double Chimney Incandescent Burner.

It is an ordinary non-luminous gas-burner, having the usual air inlets, passage for gas, tap, and handle for operating same. H is an inverted hollow sheet-metal cone, open at the top, and provided at the centre of the bottom with an opening. J is a glass cylinder supported by the usual lamp glass gallery, and about one-third greater in diameter. It extends upwards to a point slightly above the top of the mantle. K is a plug of unbleached wool inserted in the base of the burner. L is a disc in the base of the burner, and provided with perforations of such a size as to reduce the quantity of gas passing to the burner by approximately one-third of the normal supply. A sleeve containing a number of ports or passages surrounds the portion of the burner in which the air inlets are situated, and is provided with a handle by which it can be rotated so as to bring the ports either into or out of apposition with the air inlets, according as to whether the supply to the air inlets is required to be reduced or not. When large size incandescent mantles are used, the diameter of the air inlet is enlarged so as to make allowance for the expansion of the air upon heating, and also to counterbalance the throttling of the air current in the space between the lamp chimney and the hollow-glass cylinder.

To obtain "perfect incandescence of gas-mantles with a greatly diminished consumption of gas," the lamp chimney, its carrier, and the mantle are removed. The portion of the burner in which are the air inlets is unscrewed, and the inverted hollow cone H is placed in position—its base effectually closing the bottom of the cone. The plug of wool is inserted in the base of the burner and subsequently the diaphragm L. On the gas being lighted, the air for admixture with the gas, and also that required for combustion, passes downwards between the glass J and the usual inner chimney—being heated in its passage by the waste heat from the flame. The air so heated passes downwards into the cone H, and coming into contact with the pipe through which the gas passes heats it and also the gas. A portion of the heated air supplied to the cone passes through the air inlet, and admixes with the heated gas; the balance passing upwards to the flame to complete combustion. The increased temperature produced "effects perfect incandescence of the mantle, and consequent on the heating of the air and gas a very much less quantity of gas is consumed."

Feeding Devices for Continuously Operated Carbonizing Retorts.

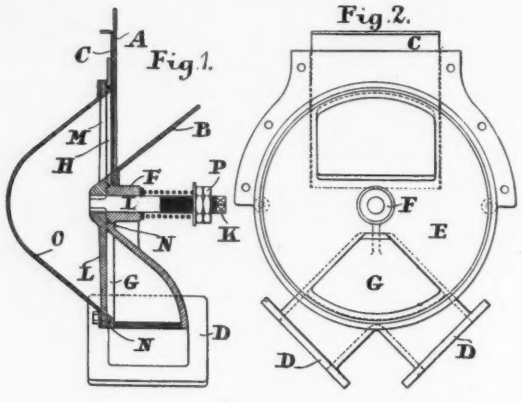
CLOUDSLEY, J. L., Jun., of Palace Chambers, Westminster.

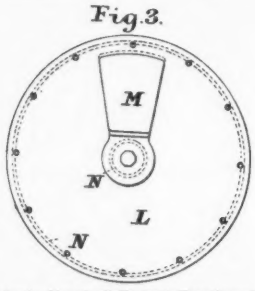
No. 26,540; Nov. 15, 1910.

As pointed out by the patentee: Continuously operated carbonizing retorts, fed by gravity so as to be constantly full of the material charged, require a continuously driven device for permitting the material to enter the retort, or shoot leading thereto, with the minimum possible escape of volatile products of the carbonization. A drum revolving in a casing has been an appliance commonly used as a feeding-device for the purpose, and, with the object of diminishing the surface of casing which has to remain substantially gas-tight, a drum oscillating on its axis has been substituted for the rotating drum. It is very difficult, however, he says, to keep the cylindrical surfaces of such drums in substantially gas-tight contact with the casing, and they are liable to allow of considerable escape of products after having been in use for a short time. The present invention relates to a device for feeding such retorts in which the material flows directly from the hopper into a pocket and from the pocket into the shoot, as determined by a revolving or oscillating disc having an opening in it which registers at each revolution or oscillation—first with the discharge opening of the hopper, and then with the outlet from the pocket into the shoot.

Fig. 1 is a vertical section through the feeding-device; fig. 2 is a front elevation (the pocket and revolving disc having been removed); and fig. 3 is an elevation of the disc removed from the feeding-device.

A B are the front and bottom plates of a coal-hopper, the discharge opening of which is adapted to be closed by a slide C. The head of the shoot leading to the retort or (as shown) the double head D, serving the shoots of two retorts, is cast in one with a plate E, having a boss F and two openings G H. The opening G constitutes the mouth of the double head D, while H is adapted to register with the discharge opening of the coal-hopper when the plate E is fixed to the front of the hopper.





Cloudsley's Vertical-Retort Feeding-Device.

The boss F is drilled to form a bearing for a shaft I adapted to be coupled by its square end K with a driving shaft, and carrying at its other end a circular disc L having an opening M. This disc has circular flanges N adapted to fit corresponding grooves in the plate E so as to run in it—oil being introduced into the grooves from time to time.

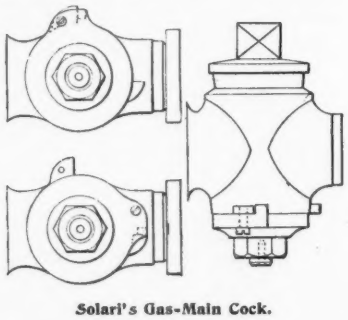
Bolted to the disc L is a dome-shaped plate O, constituting the said pocket referred to. The slide C having been raised, as the disc L revolves with the shaft I and the opening M comes into register with the opening H in the plate E coal falls from the hopper into the pocket; and when the opening M registers with the opening G in the plate, coal falls from the pocket into the head D. In order to prevent breakage in the event of coal becoming jammed between the plate E and the disc L, the shaft I is screw-threaded to receive a nut P, between which and the boss F is a spring. If the coal becomes jammed, the spring is further compressed, and the disc L yields to the necessary extent.

Gas-Main Cocks.

SOLARI, J., of Exeter.

No. 20,700; Sept. 6, 1910.

Instead of the present method of open-and-shut stop arrangement with a cut-down barrel and pin in a plug, the patentee proposes to cast two stops on the bottom of the barrel of the cock, which will engage with a stop on the bottom washer on the plug; the stop on the washer and on one or both stops on the barrel to be made large enough to allow for a hole to be drilled for a pin or screw, so as to make the cock secure either open or shut as desired.



Solari's Gas-Main Cock.

As shown, the means for limiting the rotation of the plug in the barrel consists of two laterally projecting stops provided on the barrel, adapted to be engaged by a stop provided upon, and at right angles to, the plane of the washer which retains the plug in position within the barrel. The means for locking the plug in any determined position consists of a pin or screw adapted to engage one or either of the stops provided upon the barrel and the stop provided upon the washer.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Belfast Corporation Bill, Halifax Corporation Bill, Local Government Gas Provisional Order Bills (Nos. 1 and 2), Thames Conservancy Bill.

Bill reported: Metropolitan Water Board (New Works) Bill.

Bills read the third time and passed: Merthyr Tydfil Corporation Water Bill, Paignton Urban District Council Bill.

Bills Royal Assented: Chesterfield Gas and Water Board Bill, Enfield Gas Bill, Gaslight and Coke Company Bill, Harrogate Corporation Bill, Hastings Corporation (Water and Finance) Bill, Luton Gas Bill, West Cheshire Water Bill, Wirral Water Bill.

The Gas Orders Confirmation Bill (No. 2) and the Gas and Water Orders Confimation Bill have been referred to a Select Committee, consisting of Lord Barnard (Chairman), the Earl of Hardwicke, the Earl of Northbrook, Lord Belhaven and Stenton, and Lord Aldenham; to commence sitting to-day. The Orders petitioned against are the Guisborough Water and Cannock Gas Orders.

The following petitions have been presented against the Gas Orders Confirmation (No. 4) Bill: In respect of the Busby and District Order, by the Glasgow Corporation; the Preston Order, by the Preston Rural District Council; and the Uxbridge Order, by the Hertfordshire County Council. The Preston Corporation have petitioned against alterations in the Preston Gas Order.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time and referred to the Examiners: Merthyr Tydfil Corporation Water Bill.

Bills reported, with amendments: Chapel, Whaley, and District Gas Bill [Lords], Chester Water Bill, Margam Urban District Council Bill, Rotherham Corporation Bill, Sidmouth Gas and Electricity Bill [Lords].

Bills read the third time and passed: Ashborne and District Gas Bill [Lords], Belfast Corporation Bill, Harrogate Corporation Bill [Lords].

The London Waterside Manufacturers' Association (Incorporated) have petitioned against the Port of London (First Election of Members) Provisional Order; and the Order, with the Swansea Gas Bill [Lords], has been referred to a Select Committee, consisting of Mr. J. F. Mason (Chairman), Sir Godfrey Baring, Mr. Patrick White, and Mr. Walrond, who will commence sitting on Thursday.

ST. HELENS CORPORATION BILL.

Local Legislation Committee.—Wednesday, June 28.

(*Before Mr.* GARDNER, *Chairman, Mr.* FLETCHER, *Mr.* MANFIELD, *and Mr.* R. PEARCE.)

The extensive General Powers Bill promoted by the Corporation of St. Helens, which deals, among other things, with matters appertaining to the gas undertaking (the illuminating power, the test burner, stand-by charges, and the supply of gas to areas outside the limits of the Corporation, &c.), was last Wednesday before Section B of the above Committee.

Mr. W. J. JEEVES and Mr. G. M. BAILEY appeared for the promoters. The petitioners against the Bill were represented by Mr. WEDDERBURN, K.C., and Mr. BEASLEY, for the Corporation of Widnes; by Mr. G. J. TALBOT, K.C., for the Ashton-in-Makerfield Urban District Council; and by Mr. HUTCHINSON, K.C., for the Warrington Corporation.

Mr. JEEVES, in opening, explained that St. Helens was a county borough of 7284 acres, with a population of 95,566. Among other concerns owned by the Corporation was an extensive gas-works, which was purchased from a Company in 1875. The limits of supply comprised not merely the county borough itself, but the adjoining areas of Haydock, Ashton-in-Makerfield, and parts of the district of Prescot, Windle, and Eccleston. The limits of the Corporation's supply were surrounded practically on every side by the limits of other authorities and companies. In one or two instances, the Corporation were, with the consent of the adjoining authority, supplying gas outside their limits for the purpose of obliging their neighbours. The Bill, by clause 21, sought to legalize this position, and also to give a means of legalizing a similar kind of thing should the need hereafter arise. All the petitioners against the Bill represented by Counsel opposed this clause, which was in the following terms:

> Where it is proved to the satisfaction of the Local Government Board that the occupier of any premises outside the area of supply of the Corporation is desirous of obtaining a supply of gas from the Corporation, the Local Government Board may, if the local authority within whose district the premises are situate and the Company, body, or persons (if any) authorized to supply gas to such premises consent, by Order permit the Corporation to give a supply to those premises on such terms and subject to such conditions as the Board think fit. Provided that if, in the opinion of the Local Government Board, any consent required by this sub-section is unreasonably withheld, the Board may proceed as if such consent had been given. An Order given by the Local Government Board under this section may, for the purpose of enabling a supply to be given thereunder, confer any such powers and impose any such duties on the Corporation as would have been conferred or imposed by the Gas-Works Clauses Act, 1847, or the Gas-Works Clauses Act, 1871, and as might have been conferred or imposed by Provisional Order if the premises and the route along which mains and pipes are to be laid for the purpose of giving the supply were within the area of supply of the Corporation—anything in any Act or Order relating to the undertaking to the contrary notwithstanding.

In the extensions outside the district, the needs of these people had now been met. The Corporation had no legal right or no legal authority to expend any money for the purpose of this extension; and if they had said, as they might have said, and as in one case they did say, "We have no legal authority to spend money and we do not see our way to do it," the effect would have been that those outlying premises in the adjoining limits would have been without gas to-day. The Corporation felt that it was unreasonable that this should be so. They did not want to undertake these supplies for the purpose of revenue-getting or of ousting the statutory supplies; but they did feel they were justified in coming to Parliament and asking that some such powers should be given as would enable what was being done to be legalized, and to enable the same kind of thing, if the need should arise, to be done in the future. Widnes and Warrington, who were opposing, were, curiously enough, the two authorities in whose area in one case the Corporation were supplying, and in the other case might supply. Ashton was within the limits of the supplies both of the Ashton District Council and of the St. Helens Corporation. The Corporation were not, however, supplying gas in any part of the area; but they had the power to do so. The Widnes limits came right up to St. Helens, and included areas outside the borough limits. The Widnes petition alleged that clause 21 would curtail the petitioners rights to supply gas within their authorized limits, and would authorize the Corporation to invade their area. They pointed out that their annual make of gas was 363,954,000 feet, and that they were prepared to meet any demand within the area. While Widnes could have supplied the two or three premises in the northern parts of the Widnes area supplied by the St. Helens Corporation, the guarantee required by Widnes under the Gas-Works Clauses Act, in respect of the necessary extension of mains, would have made the possibility of getting a supply altogether prohibitive. Widnes realized that they could not supply these people at a reasonable price, and accordingly gave the St. Helens Corporation full consent to supply them. Widnes emphasized the temporary nature of the arrangement; but under the clause they would be able to take over the supply of the area affected at any time by purchasing the Corporation's mains. The position taken up by Warrington was practically the same. There was no case at the moment in which the Corporation were supplying gas within the Warrington limits; but some few years ago, both the Burtonwood people and the Warrington Corporation requested the St. Helens Corporation to supply gas in Burtonwood. This request was refused, and to-day Warrington was supplying Burtonwood. The St. Helens Corporation also supplied Rainford Station and Rainford Hall, in the area of the Rainford Gas Company, and had done so since before the Company was brought into being. The Company were not petitioning against the Bill. These cases were instances of the kind of thing desired to be met by the clause. The position of the Ashton District Council was that their area should be eliminated altogether from the gas supply limits of the St. Helens Corporation. They did not in their petition object to clause 21. He submitted that it was wholly unreasonable for Ashton to take up the position they had, having regard to the fact that, even if St. Helens were using their powers in the Ashton area, they were asking for no powers that were unreasonable. The Ashton Council were afraid that St. Helens might at some time or other operate their powers to the benefit of the gas consumers in the Ashton district, but to the detriment of the Ashton undertaking, which could not supply at so cheap a rate. The Local Government Board report stated that the clause embodied a proposal which would form a new departure as applied to gas supply. It appeared to the Board to be open to considerable objection that they should be required to issue Orders dealing with the supply of gas to particular premises. Moreover, the report stated, if there should be a considerable demand for the supply of gas in any area outside the gas limits of the Corporation, the question would arise whether the area should not be brought within the area of supply either of the Corporation or of some other body or persons, in accordance with the usual procedure; and in any such case, the supply of gas in isolated instances under the clause would be liable to retard the general supply of the area. The Board suggested the omission of the clause. Counsel submitted, however, that, notwithstanding the report of the Local Government Board, if there were premises just over the border of an authority (as was the case in St. Helens) which required a supply of gas, it was eminently desirable that there should be a means whereby they could be supplied at the lowest possible rate. It might very well be proposed that at any time the authority in whose area the extra supply was given should be entitled—say, on three months' notice—to purchase any mains that had been laid by the supplying authority, and that thereafter all powers for supply by the supplying authority should cease, and the supply be wholly given by the statutory undertaking.

Mr. RHODES, representing the Local Government Board, interjected that matters would be made worse if the terms and obligations were only enforced for a month or two, and determined at the option of the authority.

Evidence was then called.

Mr. *Samuel Glover*, the Gas Engineer to the St. Helens Corporation, stated, in answer to Mr. JEEVES, that during the last 25 years he had witnessed a very great development in the St. Helens undertaking. In 1875 the St. Helens Corporation purchased the undertaking from the old Gas Company for £131,000. At that time, St. Helens was only a small part of the present borough, and the limits included the townships of Ashton-in-Makerfield and Haydock. The capital expenditure since the Corporation purchased had amounted to £339,364; but the outstanding debt to-day was only £133,000, although the works were four times larger. The Company were entitled to charge 4s. 6d. per 1000 cubic feet for gas inside and 5s. outside; but these figures were reduced to 4s. and 4s. 6d. by the Corporation when they purchased. Gas was being supplied at present at 2s. 2d., subject to an average discount of over 5 per cent. The discounts really ranged from 5 per cent. to 12½ per. cent.; so that the net price of gas for lighting was roughly 2s. This included the use of gas-

stoves and gas-meters free. St. Helens was among the earliest undertakings to abolish meter-rents, and the first to supply stoves without charge. The make had enormously increased, and the Corporation were most careful to purify their gas and eliminate the sulphuretted hydrogen, &c. Having regard to the fact that Ashton had always been within the Corporation limits, he saw no reason, in the interest of the gas-consuming public, why Ashton should now be eliminated. In one area there might be developments which would be more cheaply and beneficially supplied from St. Helens than from Ashton. The Burtonwood proposal was not accepted on the ground of expense. With regard to Widnes, at the point where the Corporation were supplying within the Widnes area, the Widnes gas-mains were about 2 miles away. The powers sought in the Bill were simply to allow the Corporation to supply, pending such developments as would justify the adjoining authority or company supplying. A supply had been provided near Bold for many years; but it was decreasing on account of the engineering works concerned generating their own electricity. The total revenue for all the supplies in the Widnes area amounted to £250. They were not at all necessary for the continued prosperity of the St. Helens gas undertaking, and were provided more in the direction of meeting the needs of the populace. The St. Helens gas undertaking had a gross revenue of about £60,000; and they felt that the existing powers ought to be legalized pending the time when the adjoining authorities would be prepared to undertake the lighting.

In cross-examination by Mr. WEDDERBURN, witness admitted that the prices for gas in Widnes were very considerably cheaper than in St. Helens. There had never been any friction in supplying gas in those parts where it was more convenient that St. Helens should do so than Widnes. There was no argument for the present proposal other than that the St. Helens Corporation wished to legalize their position. Witness was not able to quote any precedent for what the Corporation now asked.

Mr. WEDDERBURN: There is no precedent. Is it your invention, Mr. Jeeves?

Mr. JEEVES: No; it is not my invention.

Witness stated that any consumer might raise the question of the legality of the Corporation's action. As a matter of fact, no one had done so.

In cross-examination by Mr. TALBOT, witness admitted that from 1875, when the Corporation first acquired the undertaking, they had never supplied any gas in the district of Ashton. The Ashton District Council had full gas powers for the supply of the whole of their district; but they did not get the St. Helens powers put on one side. St. Helens did not raise any opposition to the measure in Parliament. Witness did not dispute the suggestion that the Ashton District Council were developing and progressing rapidly with their undertaking. The Corporation had in their minds no spirit of competition at all; but they had rights in the Ashton district, and they should exercise them if the people required gas and the Corporation were the nearest authority to give that supply. Asked whether or not the Corporation intended to exercise their powers, witness replied in the affirmative. He believed it had proved a convenient thing for two local authorities to compete for the supply of the same district, and quoted the Long Eaton case. The learned Counsel, however, pointed out that it was not really an analogous case

In cross-examination by Mr. HUTCHINSON, witness dissented from the suggestion that the Corporation were poachers, and had come to Parliament to be whitewashed. He supposed the clause would, as a matter of fact, enable the Corporation to supply gas wherever and whenever they liked, irrespective of limits, with the consent of the Local Government Board if the Corporation were so foolish as to use their powers in this way. He would not say that Warrington did not supply any person within their area whom the Corporation could supply.

In re-examination by Mr. JEEVES, witness said there was a precedent for the clause in regard to electric lighting.

Mr. *James Crooks*, the Chairman of the Gas Committee, was called at the request of Mr. WEDDERBURN; and in cross-examination he admitted that there had been a conference consisting of a large number of authorities—Wigan, Liverpool United Gas Company, Rainhill, Manchester Corporation, Huyton, Roby, Ormskirk, Ashton, and others—all of whom relied upon the opposition of Widnes and Warrington. His personal view of the clause was that where authorities who had the power were unable or unwilling to supply, the powers sought were reasonable. The Corporation asked the clause more to legalize their position.

Alderman *John Forster* was next called for the promoters. At the conclusion of his evidence,

The CHAIRMAN, without calling upon the petitioners, announced that the Committee had decided to strike out the clause.

Mr. WEDDERBURN, on behalf of Widnes, asked for costs, holding that, after the report of the Local Government Board was issued, it was a vexatious and unreasonable thing for the promoters to persist with the clause.

Mr. HUTCHINSON supported the application on behalf of Warrington.

Mr. JEEVES contested the application, on the ground that the St. Helens Corporation felt they ought to use every possible endeavour to provide the means of regularizing what they had done.

The Committee refused the application.

Mr. TALBOT then proceeded to address the Committee on the petition of the Ashton District Council. He submitted that it was an unheard-of thing that two local authorities should each have power to break-up the streets and supply gas in competition with each other. There was no such case on record. It did not exist here, of course, as there was no competition in fact. At this moment, Ashton were supplying the Great Central Railway Company just over their limits and in the township of Haydock, which was within the gas limits of the St. Helens Corporation. He appealed to the Committee that these powers, which had not been exercised by the Corporation for 40 years, and which were confessedly useless in view of the fact that Ashton were an efficient authority and were developing their business, should cease to remain on the Statute Book. It was a miserable technicality to say that Ashton should promote a Bill, and that they were taking advantage of the St. Helens expenditure. There was an absolute precedent in the Bill promoted by the Pontypridd Water Company. The Wigan Act of 1874 appeared also to be an absolute precedent.

Mr. JEEVES argued that Ashton could only get the provision they asked for by introducing into the St. Helens Bill a clause brought up by the learned Counsel.

Mr. TALBOT retorted that he asked the Committee to declare, as a condition to passing the preamble of this part of the Bill, that he was entitled to the relief he sought. If the Committee so decided, he would bring up a clause.

Mr. JEEVES contended that the precedents quoted were not on all-fours with the position in this case. He submitted that it was not the proper parliamentary practice to allow an alteration of this kind to be made for the benefit of a party other than the promoter, on a promoter's Bill, where no notice had been given. The Ashton powers were originally taken subject to the St. Helens powers.

The Committee conferred for some time in private, and then announced that no decision would be given, pending the advice of Speaker's Counsel.

The Committee then proceeded to deal with the remaining (unopposed) gas clauses. The Local Government Board and Home Office both reported upon clause 18, which empowered the Corporation to refuse to supply gas in certain cases. The Committee insisted upon the model clause. With regard to clause 19 (supply of gas where the consumer has a separate gas installation), the Local Government Board described the provision as exceptional in regard to the supply of gas, although clauses on the subject had been allowed in several cases. Mr. Jeeves submitted that where consumers had their own supply and required the Corporation to have a meter as a stand-by, the practice became particularly hard on the Corporation, as they made no charge for the meters. The Corporation asked that they should be entitled to make a minimum demand not exceeding £5 a year. Evidence was called in support of the clause, which was allowed.

MARGAM URBAN DISTRICT COUNCIL BILL.

The Local Legislation Committee of the House of Commons presided over by Mr. GARDNER had before them last Tuesday the Bill promoted by the Margam Urban District Council, which has for its object to confer general power on the Council in addition to those relating to the transfer of the portion of the Aberavon gas undertaking supplying Margam to the District Council. The part of the measure affecting the gas transfer was dealt with by Mr. Mooney's Committee (see "JOURNAL" last week, p. 1016). The financial aspect of the gas proposals were, however, before the present Committee, together with the general clauses. The financial clauses authorized the Council to borrow money (*a*) for the purchase of the gas undertaking of the Aberavon Corporation, and for defraying the costs and expenses incidental to the purchase and transfer; and (*b*) for, and in relation to, the purchase of land and for the erection of gas-works (£27,500).

Mr. HUTCHINSON, K.C., appeared for the promoters.

Mr. *Frank Jones*, in the course of his evidence, stated that a period of 40 years was usually given for the repayment of loans on new works. The value of the mains in the district was not very great—under £5000.

Mr. HUTCHINSON asked the Committee to allow 30 years for (*a*) and 40 years for (*b*).

Mr. RHODES, representing the Local Government Board, said that while 30 years was enough for the purchase loan, he must press the suggestion that separate borrowing powers should be conferred in regard to meters and stoves; that 30 years should be allowed for gas-holders, 20 years for exhausters and purifiers, and 30 years for the extension of mains.

Mr. HUTCHINSON submittted the precedent of the Lisburn case, in which 40 years was given as a reasonable period not only for new works, but for purchase.

Witness stated that the whole of the £27,500 would have a distinctly long life—60 years.

The Committee allowed 30 years for purchase and 40 years for new works.

SIDMOUTH GAS AND ELECTRICITY BILL.

The Bill of the Sidmouth Gas and Electricity Company was before the Unopposed Bills Committee of the House of Commons last Thursday. Mr. WHITLEY presided.

Mr. JOHNSTON, the Parliamentary Agent, stated that the Bill was opposed in the other House by the Urban District Council on almost every conceivable point. There was a somewhat lengthy hearing, as a result of which very considerable amendments were made in the Bill in regard to the reduction of capital, the standard price, and so on. The District Council asked for a purchase clause; but the Committee declined to give it, although a suspensory clause was granted. The Council were not satisfied; and one of the amendments which the promoters now brought forward was the introduction of a purchase clause. The standard price had been reduced to 4s., which was rather under than over the selling price. The comment of the Local Government Board was that the Committee ought to be informed of the dividends paid, and should satisfy themselves that the standard price was reasonable. With regard to this, from the formation of the Company in 1886 up to as late as 1900, the dividends varied from nothing up to 5 per cent. Only in the last six or seven years had the Company been paying the maximum dividend of 10 per cent. on the ordinary shares. During this period, in spite of the low dividends, the Company had been continuously reducing the price, which had fallen from 6s. 3d., when they started, to the present price, averaging about 4s. The Local Government Board also remarked upon the stand-by clause; but this was a clause which had been allowed by the Committee. The Board of Trade suggested an alteration of the sliding-scale dividend on the profits of the undertaking only, and not on the dividends paid on the whole capital. This went to the bottom of the whole proposal

of the Bill. It was of vital importance that the capital should be a common capital, and that the sliding-scale should operate in this way. The point had been discussed before in Bills of this character when gas and electricity were combined, and a clause similar to that now proposed had been allowed in several cases. In this case, the population was smaller than that of any of the precedents; and an attempt at an independent electrical undertaking had already failed.

The Committee accepted the Bill as presented by the promoters, and ordered it to be reported to the House.

CHAPEL WHALEY GAS BILL.

The Unopposed Bills Committee of the House of Commons, presided over by Mr. WHITLEY, had the above Bill before them last Thursday.

Mr. OLDHAM, the Parliamentary Agent, explained that this was not a money-making company in the ordinary sense; they might be regarded as a consumers' company. Their main object was not to make a large profit, but to serve the interests of the community in the best possible way. As evidence of this, he mentioned that the directorate included five district councillors, and that the Company were asking not for the usual 10 per cent. dividend on the original and new capital, but only for 6 per cent.

Mr. MOON (Speaker's Counsel) directed attention to clause 28, which provided that when any shares or stock forming part of the additional capital authorized by the Act was to be issued, the Company, before offering them for sale by public auction, might, with the approval of the Board of Trade, offer such stock to the gas consumers and the persons employed by the Company at as near as might be the average market price of the shares of the Company. This provision was against the Standing Orders of the House, which provided that all new capital should be submitted to public auction.

Mr. OLDHAM argued that the clause was very desirable, particularly in relation to a company so governed as that of the promoters. He quoted the "JOURNAL OF GAS LIGHTING" for Jan. 3 last in support of the clause: "A much (in our opinion) neglected provision is included in this Bill. It is one that empowers the Company to offer issues of stock or shares to consumers and employees of the Company before submitting them to public auction or tender. Incontestably, it is a good thing to get the consumers and employees to have a financial interest in the concern."

The CHAIRMAN: We are not able to allow this clause.

The clause was accordingly struck out; and the Bill, as amended, was allowed to proceed.

LEGAL INTELLIGENCE.

SALE TO A CORPORATION OF GAS-WORKS.

RIGHTS OF DEBENTURE HOLDERS.

Judicial Committee of the Privy Council.

(*Before Lords* MACNAGHTEN, ATKINSON, MERSEY, *and* ROBSON.)

Perth Gas Company, Limited, v. Corporation of the City of Perth.

An important decision for shareholders in gas companies, although only on an interlocutory point raised on a special case stated in an arbitration, was decided in favour of the Gas Company, the appellants, who had appealed from a decision of the Supreme Court of Western Australia in favour of the respondents, the Mayor and Councillors of the City of Perth. By the Perth Gas Company's Act, 1886, the appellant Company was incorporated with the objects of lighting the streets and buildings in the city. By section 50 of the Act, the Corporation could, by giving notice, acquire by purchase, at any time after Dec. 31, 1906, "all the land, buildings, works, hereditaments, lamps, pipes, stock, and appurtenances of, and belonging to, the Company in the name and on behalf of the Corporation." It provided also that, if the terms of the sale should not be agreed upon, the matter should go to arbitration. Before the Arbitrators, the Corporation took the point that the purchase money should be calculated on the basis merely of the value of the buildings, works, stock, and appurtenances *in situ*, regarded as capable of earning a profit, but should not include the value of the Company's statutory powers and privileges, or the amount of the profits that had been, or could be, earned by means of the property or the exercise of the powers and privileges in the Company's business. The Company did not agree to this basis, and the Arbitrators and Umpire stated a special case for the opinion of the Supreme Court, asking whether or not, in calculating the purchase money, regard should be had to (*a*) the value of the Company's statutory powers and privileges and (*b*) the amount of profits that had been, and could be, earned by means of the property and the exercise of the powers and privileges in the business of the Company. The Supreme Court answered the question in favour of the Corporation; and the Company appealed.

Sir ROBERT FINLAY, K.C., Mr. T. D. DRAPER, K.C. (of the Australian Bar), and Mr. F. WHINNEY appeared for the appellants; Mr. P. OGDEN LAWRENCE, K.C., and Mr. J. A. NORTHCOTE (the latter of the Australian Bar) were for the respondents. Messrs. Sutton, Ommanney, and Rendall (for Messrs. Parker and Parker, of Perth) were Solicitors for the appellants, and Messrs. Blyth, Dutton, and Co., for the respondent Corporation.

The arguments were concluded on May 17, and judgment was reserved.

Judgment.

Lord ATKINSON, who delivered the decision of the Judicial Committee, said the question resolved itself into this: What was the thing sold? Was it the whole undertaking of the appellant Company, or merely all the local works, pipes, and other physical things by means of which they carried on their business? The answer depended upon the construction of section 50 of the Act of 1886, which section appeared to him not to have formed part of the Statute, as originally drafted. It seemed to have been inserted as an afterthought, without any attempt having been made to reconcile its provisions to those of the other sections of the Act, or with the general principles of law affecting incorporated joint-stock companies. Hence the difficulty of putting any meaning consistent with common sense and justice on its inapt and ambiguous language. Therefore, in order to solve this difficulty, it was necessary to consider some of the other provisions of the Act. His Lordship then dealt with the other provisions of the Act at considerable length; and, coming back to section 50, he said it was clear that this section provided that if any dispute or disagreement should arise, which might not, however, be a dispute or disagreement touching the price at all, but touching some other term or condition of the contract, the parties, or either of them, might, if they thought fit, require that it be referred to arbitration to determine, not the matter in dispute, but the amount of the purchase money, upon which matter alone was the determination of the arbitrators binding on the parties. It might possibly be that if the amount of the purchase money was the only matter in dispute the Company could not refuse to carry out the sale after the Arbitrators had fixed the price. But if the Company should, for instance, insist that their pending contracts should be carried out by the Corporation, and the latter refused to yield on this point, it seemed clear that the Directors could not be compelled to carry out the sale. There was no way of getting rid of the charge of the debenture holders upon the assets of the Company sold under section 50, save by their concurrence in the sale. There was little doubt that the debenture holders could by law restrain the Directors from completing against their will a transaction which would so vastly diminish the value of the debentures they held. The Directors, like every other encumbered vendor, would be bound, in the absence of agreement to the contrary, to convey to the purchaser the property sold free from encumbrances. All these considerations, in their Lordships' opinion, went to show that what the Statute contemplated was the sale of the whole undertaking, the whole charge, carried out with the consent of the encumbrances whose claims would then attach to the money which represented the entire property. There were no words in section 50 which prohibited such a transaction. Indeed, it was the only just and only workable one. Every other one was beset with difficulties almost, if not altogether, insurmountable. Their Lordships were therefore of opinion that the judgment appealed from was wrong, and should be reversed. Accordingly, they humbly advised His Majesty that the appeal should be allowed with costs.

DEBENTURES IN THE TEWKESBURY GAS COMPANY.

In the action of "Tysoe *v.* Tewkesbury Gas Company," which came before Mr. Justice Parker on the 13th ult., the plaintiff claimed a declaration that the mortgage debentures issued by the Company constituted a first charge upon all the property of the Company, and for the usual accounts and inquiries.

The Company was incorporated in 1870; and in December, 1892, in pursuance of a resolution of Sept. 19, it borrowed and raised for the purposes of the Company £2000 by the issue of a series of debentures for this amount. Each debenture provided that the Company would, on and after Jan. 1, 1898, pay the registered holder thereof for the time being the sum of £100; that the debentures to be paid off would be determined by ballot; and that six calendar months' notice would be given by the Company of the debentures drawn for payment. Interest was to be payable at the rate of 4 per cent. per annum, payable half-yearly. The conditions on which the debentures were issued were that all were to rank *pari passu*, and were to be a charge on all the plant, machinery, stock, book and other debts, goodwill and assets, and generally on all present and future property, real and personal, of the Company; and that such charge was to be a floating security, but so that the Company was not to be at liberty to create any mortgage or charge in priority to the debentures. It was further provided that nothing in the debenture should create any charge on, or prevent the Company from selling, assigning, or otherwise disposing of any business rights or privileges which were then, or thereafter might be, vested in, or held by, the Company. No debentures had been paid off, nor had a ballot been held. On Nov. 18, 1909, plaintiff gave notice to the Company to pay off the principal sum of £100; but this had not been done—the Company contending that, on the true construction of the mortgage debenture, it was at liberty, at its personal discretion, on or at any time after Jan. 1, 1898, to redeem the debentures. As the Company had never exercised its discretion, it was urged that the debentures had not become due.

Mr. GRANT, K.C., and Mr. OWEN THOMPSON appeared for the plaintiff; Mr. ROMER, K.C., and Mr. LUXMORE for the defendants.

His LORDSHIP reserved judgment, which was delivered on June 21. The question to be determined was what was the true construction of the debenture; and in determining this question, he could not properly refer to the prospectus on which the debentures were issued. The Company had sealed a debenture which, on the face of it, was transferable; and they were bound by the terms of the debenture, which provided that the Company would, on and after Jan. 1, 1898, pay the sum of £100. A covenant to pay created a liability to pay on demand; and a covenant to pay on or before a certain date created a liability to pay on the date named, with an option of earlier payment. On the true construction of the covenant, and in the events which had happened, the £100 was due and payable. But it was said that this meaning ought to be rejected because of the clause which provided that the debentures to be paid off would be determined by ballot, with six months' notice given by the Company of the debentures drawn for payment. The Company was not bound to hold a ballot, and it might very well be argued that this clause inferentially conferred on the Company a power to pay off any debentures before the given date provided the debentures were balloted for and notice given. This, however, was not the way

in which the Company asked the Court to construe the clause. Their contention was that they were not bound to pay any debentures unless they elected so to do, in which case they must hold a ballot. In other words, they said a covenant imposing liability to pay exempted them of all liability to pay unless they chose to hold a ballot. This would be a somewhat extraordinary construction; and he (his Lordship) could not see his way to adopt it. There would be judgment for the plaintiff for the principal and interest, with costs, with liberty to apply if the debenture was not paid within two months.

A stay of execution was granted with a view to an appeal.

Bankruptcy of a Gas-Stove Manufacturer.

The first meeting of creditors of Mr. Charles Edwin Ryder Terry, of Leamington, was called for the 26th ult. at the office of the Official Receiver, Coventry. The summary of debtor's statement of affairs showed gross liabilities amounting to £4277; but he believes that his assets exceed his liabilities, though in the Official Receiver's opinion they are of such a nature that it is difficult to estimate what they will realize. According to his statement to the Official Receiver, the debtor was formerly the Manager of a manufacturing firm in Birmingham. In March, 1901, having a capital of about £4000, he commenced business in partnership with a Mr. G. H. Walker; taking over the business of Messrs. Radcliffe and Co., range manufacturers and ironfounders, of Leamington—the purchase price being £4250. To this was subsequently added a business for the manufacture of gas-stoves, which was carried on under the title of the Imperial Stove Company. In 1902, the partnership business was amalgamated with that carried on by Messrs. Sidney Flavel and Co., when a new Company—viz., the Flavel Range and Imperial Gas-Stoves, Limited—was formed for taking over the businesses included in the amalgamation. For his share of the transaction, the debtor received 6000 £1 ordinary shares in the new Company; and, in addition, 1200 £1 preference shares were allotted to his wife, as consideration for moneys advanced by her to her husband, and used in the partnership business. Scrip for 3000 of the shares allotted to the debtor was handed to Mr. Sidney Flavel as security in respect of a guarantee given by the debtor to him in regard to the profits of the new Company. The debtor was retained as Managing-Director of the new Company at a salary of £300 per annum, which amount was for three years used in payment of his share of the liabilities of Messrs. Ratcliffe and Co. In April, 1910, debtor left the service of the Company, and subsequently issued a writ against them on the 24th of October last for damages for wrongful dismissal; but the action has not been tried. A few days later, Mr. Sidney Flavel issued a writ against the debtor for the recovery of money alleged to be due to him in respect of his guarantee. The debtor defended the action, which was heard in April last, when judgment was given ordering that an account should be taken to show what money, if any, is due. Mr. Flavel considers that there is a sum of £12,307 owing to him; but the debtor does not admit the liability. The meeting was adjourned, owing to the absence of a quorum.

Claim for Compensation by a Beckton Workman.

Some weeks ago, his Honour Judge Tindal Atkinson heard a case in which a workman named Lock claimed compensation from the Gas-light and Coke Company for injuries sustained at their Beckton station. It appeared, from the statement made by the applicant, that, noticing that one of the chargers was approaching him, to receive a supply of coal from bunkers under his control which he knew to be insufficiently filled, he lowered himself into the basement for the purpose of communicating with the driver of the engine working the coal-hoist. As he was returning, the charging-machine caught him by the back of the neck, and held him suspended over the basement, which was 8 feet below. When the driver backed the machine, the applicant fell into the basement. The Company denied liability—first, because it was no part of the applicant's duty to communicate with the engine driver, and consequently the accident did not arise "in the course of his employment;" and, secondly, if it did so arise, applicant was guilty of "serious and wilful misconduct" in going to a part of the premises in which he had no business. His Honour, in a long considered judgment delivered a short time since, came to the conclusion that the act of communicating with the engine driver was not outside applicant's employment. The question then presented itself: Did the accident arise out of the employment? The conclusion he had come to was that it did not. He had next to consider whether there had been "serious and wilful misconduct" on the part of the applicant. In his opinion, there had. But this was not to be a bar to the recovery of compensation, if it resulted in death or serious permanent disablement. The applicant had sustained such disablement; and therefore the respondents were precluded from relying on his misconduct as a defence to the claim. As, however, he had decided in their favour on the other point, the award would be for them. His Honour said that, in the event of there being an appeal, he would state his conclusions in writing, so that his findings might be put clearly before the Court.

Rhyl District Council Gas Supply.

The working statement presented by Mr. Leonard G. Hall, the Engineer and Manager of the gas undertaking of the Rhyl Urban District Council, for the year ended the 31st of March last, shows that the quantity of gas made was 60,292,000 cubic feet, of which 54,815,000 cubic feet were sold for private and public lighting; being 90·92 per cent. of the total production. The quantity of coal carbonized was 5104 tons; and it yielded per ton 11,811 cubic feet of gas, of which 10,739 cubic feet were sold. The residuals produced were: Coke, 3254 tons, of which 2359 tons were sold; tar, 56,100 gallons (11 gallons per ton of coal); ammoniacal liquor, 167,700 gallons (32·8 gallons per ton of coal). The manufacture of gas cost £5002; and the gross cost was £6754. Deducting the returns for residuals, the net cost was £4868. The revenue being £10,257, the profit was £5389; being at the rate of 1s. 11·59d per 1000 cubic feet of gas sold.

MISCELLANEOUS NEWS.

SWINTON AND MEXBOROUGH ARBITRATION.

The Price to be Paid for the Gas-Works.

A report appeared in the "JOURNAL" last week (p. 1016) of the first day's proceedings in an arbitration—held at the Surveyors' Institution, Great George Street, Westminster—to determine the price to be paid by the Swinton and Mexborough Gas Board for the undertaking of the Swinton and Mexborough Gaslight Company. The arbitration arose out of an Act of 1909, under which a Gas Board for the two urban districts named was established, and obtained power to acquire the undertaking of the Gas Company. The hearing occupied five days—June 20, 21, 26, 29, and 30.

The Arbitrators were Mr. CORBET WOODALL, for the Company, and Mr. HARRY E. JONES, for the Gas Board. Mr. A. J. RAM, K.C., acted as Umpire.

The Hon. J. D. FITZGERALD, K.C., and Mr. F. N. KEEN (instructed by Messrs. Baker and Co.) appeared for the Company; while Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX, K.C. (instructed by Messrs. Lees and Co.), represented the Board.

Second Day's Proceedings.

Mr. *E. H. Stevenson*, re-called, and further examined by Mr. FITZGERALD, handed in a statement as to revenue from sales of tar and liquor, showing the adjusted stocks of tar for 1909 and 1910 on the basis of 11 gallons per ton of coal carbonized.

The UMPIRE said he understood from the Arbitrators that they were prepared to agree, subject to what Counsel might say, to the figure of 11 gallons of tar. They took it as a fact that probably there had been a miscalculation in the stocks. It was also agreed to take the liquor for the period in question at 14 gallons of 14-oz. strength, or 19·6 gallons of 10-oz. strength.

Witness remarked that the alteration which would be required in his figures for the error in tar and liquor was so slight that it was not worth speaking of, because he had taken 20 gallons of 10-oz. liquor, and the figure for tar was accepted.

Examination continued: In respect of the increase in prepayment consumption which he anticipated, he added £218 for the purpose of arriving at the profit for 1911; and this, put on to his adjusted profit of £3337 for 1910, made his estimated profit for 1911 £3555.

Mr. CORBET WOODALL: Why did you go into 1911 at all? Do you claim for prospective profit?

Witness: Because the value of the undertaking has to be on the day of transfer; and I do not think it is possible that the day of transfer can be earlier than Dec. 31. So that the Company will have the working of 1911; and the valuation ought to be on the value of it at the end of 1911.

Mr. FITZGERALD: Then, taking this figure as the estimated adjusted profit for 1911, the first deduction is the interest on an existing mortgage of £6000.

Witness said that was so. At 4½ per cent., this was £270. Capital liabilities (in which he included the cost of the Act of 1908, which the purchasers had to pay) he put at £12,000; and 4½ per cent. interest on this was £540. This made the interest on the mortgage and overdraft £810, and would leave the estimated available net profit at the expected day of transfer £2745. In the next paragraph of his valuation, he showed how he appropriated this. In the first place, he took a reduction of 4d. per 1000 cubic feet in the price of gas, which would represent £581. This would enable them to pay dividends of 11 per cent. on the £9500 "A" stock, and of £7 14s. per cent. on the £10,000 "B" stock. These dividends would absorb £1815; so that there would still be a surplus of £349. As a matter of fact, the Company had not reduced the price of gas yet; they simply went on in the old way. They could, however, have done so very easily. The £1815 of dividends he had capitalized at 28½ years' purchase, making £51,727; and to this he added 10 per cent. for compulsory purchase (£5173), bringing the total value of the undertaking out at £56,900. He had taken 28½ years' purchase because the undertaking was just at the beginning of its history as a standard price Company. It was increasing in size fairly rapidly. The profits were also increasing; and he had no doubt whatever that the following year they could reduce the price of gas again at least 2d. per 1000 cubic feet, if not more, and increase the dividends. In fact, the balance shown by him allowed for a further reduction of 2d., which he had not taken into the dividend calculation; and the natural growth of the undertaking would allow of additional reductions in price before very long. Then it was admitted that, taking a concern as a whole, one always gave a higher price than for individual shares. He admitted that he had given a higher number of years' purchase than he would have done if there had not been a prospect of a reduction in the price of gas and an increase in the dividends. He would then have asked for 26⅔ years' purchase.

Mr. HONORATUS LLOYD (in cross-examination): As I understand, the amount of your valuation is £56,900. Then, in addition to this, of course, we have to pay the £6000 mortgage, and the figure, which you say is £12,000, for capital liabilities. That makes it £74,900; and it means we should then have an undertaking dealing with 34,892,000 cubic feet of gas?

Witness: No. You have left out public lighting—2,500,000 feet.

Then it is somewhere about 37,000,000 cubic feet. That is rather a convenient figure, because 37,000,000, divided into £74,900, gives me just over £2000 per million cubic feet. That is the capital at which I should start my business. It is pretty hot, is it not?—No; not for purchase. There have been a number of purchases as high as that, and some more. I should think you could borrow money at 3½ per cent., which gives you £70 per million cubic feet.

Do you know that in 1908 the 5½ per cent. shares were quoted on the Sheffield Stock Exchange at 6¼-6⅜?—No; and if I had known it, it would have made no difference in my view of the matter.

Then on June 19, 1911 (that is, this month) the 10 per cent. shares were quoted at 7-7½; and the "B," at 5¾-6¼. Your price (making all due allowance for the fact that it is a whole concern, as against portions) works out at about £17 per share?—That is with the 10 per cent. put on.

And without the stock, &c.?—Yes.

In addition to all your figures, we should have to find something for working capital?—Yes; a small amount. I should think about £1500, or perhaps £2000.

You take the adjusted profit for 1910 as being £3337. Is there included in that the adjusted profit made upon the prepayment meter business, which has been largely found by my capital?—Yes.

Is the next figure, £218, entirely one of increase in prepayment consumers?—Yes. But the profit is not because of prepayment consumers; it is because of the improved working of the Company.

You show how £1815 might be distributed, upon a reduced price of gas, by giving 11 per cent. on the £9500, and £7 14s. on the £10,000. In other words, Parliament having prevented your raising any further capital, and saying that I should repay you capital expenditure, you now take credit for the profits that are earned by the different working, and you apply the benefit of those profits to the old capital; and so you get at the result?—Yes; and we should have been perfectly right if we had reduced the price of gas this year, and divided those profits. Parliament did not put any stop upon the Company improving its position. There is absolutely no sterilization in this Act.

Can you tell me whether part of the leakage has been reduced by taking the weights off the gasholder?—I do not think so. But there is the works pressure of from 34-10ths to 36-10ths; and that shows there is ample pressure in the district.

Re-examined by Mr. FITZGERALD, witness said that £2000 per million cubic feet of gas sold had been not an unusual price at all to pay for undertakings in the past. In the case of the Prestatyn gas undertaking, the price, if he remembered rightly, was over £3000 per million feet sold; and this was very largely due to the prospective value which was claimed.

Mr. *Henry Woodall*, in answer to Mr. KEEN, said that he had twice visited the works of the Gas Company (for whom he acted in connection with the application to Parliament in 1908), and had prepared a structural valuation of the works. The figures of the capital expenditure shown in the Accountants' tables was £34,423; and his structural valuation showed that this capital was amply represented in the works themselves—the total of his valuation being £35,645. In his opinion, the works were in very fair order; and the buildings were suitable and substantial. His structural valuation agreed very closely with that of Mr. Stevenson; but there were one or two slight differences. He had prepared a table showing the capacity of the works and the surplus or deficiency in relation to the average day of the maximum week's make in 1910. The make on the average day of the maximum week was 203,000 cubic feet. There was plenty of room for extensions on the present site, which was well situated. The capacity of the coal-store was 700 tons; whereas six average weeks' consumption was only 473 tons. The tar and liquor tank was much larger than was necessary for the purpose. The retort-house and retorts were much in excess of requirements. The condenser was equal to the demand, and the exhauster was really too big for the work; but the scrubber was deficient, and he had allowed for an addition. The capacity of the purifiers was above the maximum day's make; and he had reckoned in the cost of re-sheeting the old gasholder, to increase the storage capacity. The value of the surplus plant he reckoned at £4819; and the deficiencies he put at £605—making a net surplus of £4214. In 1910, the total expenditure on repairs and maintenance of works, mains, and meters was 7¼d. per 1000 cubic feet of gas sold; and in his opinion this was more than was necessary to keep the plant in its present condition. In connection with this matter, it was somewhat important to note that, in the case of the prepayment meter business, meters only were provided by the Company, and not gas-fittings. In view of the way in which the district was honeycombed with coal-workings, he would expect the leakage to be high; but he thought it might be very much lower than it was. The increased profits would more than counterbalance any additional expenditure necessary to reduce the leakage. As to repair and maintenance of works, the amount in 1910 was 4·73d. per 1000 cubic feet of gas sold; but to his mind 3d. should be ample, as there was no machinery. A reduction of 1·73d. per 1000 feet was equal to £253 a year. He had prepared a valuation of the undertaking based on the assumed profits of 1911. He took first the profits shown in the accounts for the year 1910, £2722; and to this he added the following items: Excess expenditure on repairs, £253; error in quantity of tar and liquor. £277; additional allowance to directors, £40; gratuity to old servant, £19; and one week's additional wages paid in 1910, £29. This made a total of £3340. Then he allowed a 10 per cent. increase in consumption, which came to £334, making £3674. Then he deducted £270 interest on the mortgage, and £594 for interest at 4½ per cent. on a bank overdraft of £13,200, leaving a net estimated profit at the end of 1911 of £2810. In the matter of the overdraft, instead of making the round addition which Mr. Herbert Stevenson did to bring the figure up to £12,000, he had added to the actual £11,554 sums of £305 for re-sheeting the old gasholder, £300 for a new scrubber, and £1050 for new meters and services. The profit of £2810 he appropriated as follows: Reduction in price of 4d. per 1000 cubic feet, £644; and maximum dividends of £11 and £7 14s. per cent., £1815. This left a surplus of £351. The £1815 was a well maintainable figure, as there was a surplus shown after paying it. There was also an excess value in land and plant, while the output was growing steadily, and there was a large number of people desirous of having gas. Having regard to these facts, he thought 28½ years' purchase was the right figure to take. To this he added 10 per cent. for compulsory purchase—making the total £56,900. In addition to this sum, the Board would have to discharge all liabilities, including the bank overdraft, and to purchase stock-in-trade, &c., in accordance with the Act.

Mr. HONORATUS LLOYD (in cross-examination): What in your view would be a fair figure to take, one year with another for the future, in order to cover all works of repair?

Witness: In order to earn this revenue, I think the amount I have allowed [5·52d. per 1000 cubic feet of gas sold] is quite sufficient. I should personally spend more; but I should get a larger revenue.

My point is this—apart from the result, whether you produced more income or whether you could divide it, what is the proper sum that you say ought to be set aside to be spent on repairs?—Answering your question, I should say that 7½d. would keep works, mains, meters, and stoves in good condition; but I also say that it would enable us to earn a larger revenue, and to reduce the price. Then, with our lower price, we could divide more.

Cross-examination continued: Great improvements had been made since he saw the works early in 1908. The old retort-bench was then in a very bad state. The new retort-bench was put in subsequently. In making out his structural valuation, he had adopted what it would take to construct the works. He had not depreciated in any way. As he had said before in his evidence in Parliament, he really thought the exhauster ought to be duplicated, at a cost of £150. The 28½ years' purchase he regarded as a reasonable figure.

Re-examined by Mr. FITZGERALD, witness said he gave evidence in the Prestatyn gas case. His evidence then was that the maintainable income was £521; and the award was in round figures £14,200. This would be equal to close upon 28 years' purchase, or 27½ years' purchase of the maintainable income. But in that case, as in the present one, there was a prospective profit.

Mr. FITZGERALD: Are you quite clear that by an expenditure of 7½d. per 1000 cubic feet on the works and repairs they would be kept in good order and in a position to earn an additional dividend?

Witness: Yes; I think with this expenditure the leakage would be reduced very considerably.

Mr. HARRY JONES: 7½d. would be about the normal repairs for a works of this sort, would it not?

Witness: Yes; I think it would be full. You see, there is no machinery of any sort in the works, except just the exhauster driven by a gas-engine.

Mr. FITZGERALD: Now, if 7½d. would be about right for a normal undertaking, what do you say about an undertaking which is on a site that is constantly moving—subsiding? You would not consider it was sufficient in a case where the subsoil is always moving?

Witness: I think when you visit the works you will see that there is not very much damage except with regard to the gasholder, which is out of level; but it is working perfectly well, and has worked perfectly well for thirty years, and I see no earthly reason why it should not go on working satisfactorily.

Mr. CORBET WOODALL: I should like, in view of possible contingencies hereafter, to know whether you regard the 7½d. as due to the fact that there is subsidence in the district, or whether you consider it a reasonable sum for works in good order with no special charges?

Witness: I think it would be too high for a works with no special charges and in good order.

Mr. CORBET WOODALL: I think you will probably find that if you eliminate depreciation you never spend more than 6d. upon repairs and upkeep.

Mr. *J. H. Brearley*, examined by Mr. FITZGERALD, said he was well acquainted with the Company's works and the area of supply. The site was an excellent one; and there was considerable surplus area for future development. The coal-store was ample; and the retort-house was a spacious, well-constructed building. From every aspect, the carbonizing plant represented a considerable surplus over the present requirements. The condensers were in excess of present needs, and so was the exhauster, though it would probably be better if there were two smaller ones. The scrubber, with careful working, was equal to existing requirements; but improved results would undoubtedly be obtained if an addition were made, at a cost of from £250 to £300. Personally, he would supplement the purifiers, not because they were not big enough, but to produce more economical working. He would suggest spending £300 in this way. The whole of the large gasholder was more than 40 yards from the railway fence. In April, he took measurements and found the maximum difference in the levels of the tank was 9 15/16 inches; while on visiting the works again in June he discovered that the maximum difference in levels was 9⅝ inches—showing a reduction of 5/16 inch in practically two months. The governors were ample; and the stores and workshops were well equipped, and quite equal to the Company's business. In his opinion, the leakage could be still further reduced. He had inspected the mains at different points, and found them good. In no case were the joints leaking. There was a reddish brown oxide on the outside; but this was really one of the best preservatives of gas-mains. In 1901, there were 4116 houses in the district of supply; and now there were 5941. On last year's accounts, the consumption of gas per consumer worked out at 12,162 cubic feet. In 1901, it was 33,700 cubic feet. This showed that a certain number of large consumers had gone, and their place had been taken by smaller ones, which undoubtedly improved the stability of the undertaking. He produced a valuation of the works and distributing apparatus, arriving at a total of £36,038, to which had to be added the cost of the 1872 Provisional Order, amounting to £347. He quite agreed with Mr. Stevenson that 3d. per 1000 cubic feet was a fair figure for repairs of works. He had corrected the accounts accordingly—adding £250 to the available balance. Coming to his final valuation, he made the adjusted profit for the year 1910 £3299 (taking the incorrect apportionment of sales of tar and ammoniacal liquor at £243 10s., and six-sevenths of one week's wages on account of 53 weeks being included in 1910 £25). Then he added for increase in private consumption, based on the average rate of increase during the last three years (6·88 per cent.), £227, giving an estimated adjusted profit for 1911 of £3526. From this he deducted, for interest on the mortgage and £1200 capital liabilities, £810; leaving an estimated available net profit at the expected date of transfer of £2716. This he appropriated in a reduction of 4d. in the price of gas, £583, and in the payment of the authorized dividends of £11 and £7 14s. per cent., with gas at 3s. 2d. per 1000 cubic feet, £1815—leaving a surplus of £320. The £1815 he multiplied by 28·57 years' purchase, giving £51,854, to which he added 10 per cent., or £5185, for compulsory purchase; making a total of £57,039. In addition to this, the Gas Board would take over the mortgage debt, pay the amount of overspent capital, and pay the taxed costs of the

Company's 1908 Act, reasonable costs of winding-up the Company, compensation to officials, value of stock-in-trade, coal, &c., at the date of transfer. The Company would retain any cash in hand or in the bank, book debts, and any profits to be divided at the date of transfer. If the sales of gas went on during the next three years as they had done during the last three, the sale in 1913 would be 42,831,500 cubic feet; and he had no doubt a greater figure than this would be achieved. This would, he estimated, mean 970 additional prepayment meter supplies, the cost of fitting up which, at £4 5s. each, would be £4122. The increased profit from the larger sale of gas would be £729; and deducting £206, as the annual charge for interest and dividend at 5 per cent., on the cost of fitting up, there would be a surplus profit for reducing the price of gas and increasing the dividend, as per sliding-scale, of £523.

Cross-examined by Mr. VESEY KNOX, witness said he felt confident the works, mains, and meters could be maintained at 5½d. per 1000 cubic feet. The charge at Longwood was higher; but this was owing to special circumstances which did not exist at Swinton.

Third Day.

Mr. *C. H. Holland*, examined by Mr. FITZGERALD, said he was Assistant-Secretary and Assistant-Manager to the Gas Company, who, in 1906, engaged a man for the purpose of detecting and remedying the leakages in the mains, except when he was meter-taking, which might occupy a month out of the year. The leakage was due principally to drawn joints and fractured mains. The former had been re-caulked; and in some parts of the district smaller cast-iron mains had been removed and steel mains substituted for them. In this way the leakage had been, and was still being, diminished. About two years ago, weights were placed on the gasholder to increase the pressure in the Kilnhurst district; and there was no foundation for saying that they had since been taken off. The total weight put on was approaching 2 tons, and would produce perhaps 2-10ths extra pressure. There had never been any difficulty in working the gasholder by reason of the list; and therefore he attached very little importance to it. It became necessary to put on new guide-wheels, at a cost of 7s. 6d. each, to replace two that were broken; and while this was being done, a carriage (worth £4 7s. 6d.) fell into the tank, and had not been recovered. No damage was caused through it remaining there, because the tank was a good deal larger than the holder, having been made with a view of telescoping the holder if necessary. As to the small holder, there was no ground for saying that the tank leaked. At the general meeting of the Company on April 22, 1909, it was resolved "that the Directors' remuneration be increased to £100 per annum." Previously, it was £80; and it was stated that the increase was in consideration of the Directors having had a good many extra meetings in connection with the Act of 1908 and the Gas Board's application to Parliament.

Mr. HONORATUS LLOYD: The resolution is what I thought.

Mr. HARRY JONES: That would be permanently.

Mr. FITZGERALD: The Company were expecting to come to an end that year, or the beginning of the next year.

Cross-examined by Mr. HONORATUS LLOYD, witness said he had been Assistant-Secretary for nine years; but he had never been formally appointed Assistant-Manager. He assisted his father (an old man), who was both Manager and Secretary. The man they engaged to look after the leakage was a main and service layer. Some of the mains were turned and bored; and many of the joints were cemented. The man they originally engaged to see to the mains was not with them now; but others had taken his place. The Water Company had recently complained that the water in their mains was contaminated by gas. There had been complaints in one or two districts of want of pressure. The small holder required resheeting; but he was satisfied that the tank was all right. The large holder was constructed with the idea that it might later on be telescoped; but it had not been suggested that this should be done. Several of the guides of the holder had required to be adjusted. This was before the new carriage was fitted on. Witness then proceeded to explain the method adopted for taking the stock of tar and liquor in the storage tank.

Re-examined by Mr. FITZGERALD: The Company had been advised by a mining engineer, Mr. John Longbotham, in 1903, not to spend £2000 in purchasing the coal under the large gasholder; and in the eight years that had since elapsed, the whole expenditure they had been put to in connection with the subsidence of the holder could be covered by a five-pound note. This showed the wisdom of Mr. Longbotham's advice.

It was intimated that this concluded the Company's case; and evidence on behalf of the Council was at once called.

THE CASE FOR THE COUNCIL.

Mr. *William Cash*, examined by Mr. HONORATUS LLOYD, said he had examined the books and accounts of the Company, and eventually agreed with Mr. Keen the set of tables which had already been put in. Under section 26 of the 1909 Act, the Company were to maintain until the transfer "the proper conduct of the undertaking, and any expenditure incurred by the Company on capital account prior to the transfer with such consent"—that was, the consent of the Board—"as aforesaid shall, upon the transfer, be repaid to the Company by the Board." The evidence he was about to give would proceed on the assumption that, subject to this consent, the Board were to repay the over-spent capital account. No capital had been raised since 1886; and the capital account was, at the end of 1910, over-spent to the extent of £8923, and had been consistently over-spent all through the history of the Company. There had been nothing in the shape of depreciation written off in respect of meters or stoves. The allocation between capital and revenue was rather a rough-and-ready one. They had followed the Company's allocation as far as possible. The Board were to repay to the Company the over-spent capital; and assuming that there should have been a greater deduction for depreciation of meters and stoves in the past, then the figure of £8923 would be correspondingly amended. He regarded this as a most important point. It was not only a question of whether in the final year which they were considering as the basis for arriving at the compensation to be paid to the Company, there was a charge for repairs and maintenance of stoves and meters; but if there ought to have been, and was not, such a charge in the earlier period, then the figure would have been correspondingly altered, and so, as a natural consequence, the balance of undivided profit as disclosed by the balance-sheet would be reduced. The same remarks applied to the note appended to the tables, that there had been no adjustment made in respect of any disused or abandoned plant. In 1909, the total capital expenditure was £33,322, which was equal to £642 per million cubic feet of gas made, and £988 per million sold. So far as his experience went, he could not think of a single company that did not write off depreciation for stoves. As to the liability of the Board to repay the over-spent capital, it was, of course, essential that care should be exercised to see that they did not pay for the same thing twice over; and in his opinion this was the most difficult part of the whole case. If the Board were to repay to the Company the whole of the over-spent capital, then he did not see that the Company were entitled to claim, in effect, a premium upon it—as they did by using the surplus earning power of this capital expenditure to increase their dividends.

Mr. HONORATUS LLOYD: Mr. Brearley, after giving his forecast for 1911, went on to 1913 for comparison for certain reasons; and he makes the principle with admirable clearness. He claims to compare the year 1913 with the year 1910 on the basis of 6·88 per cent. increase of sales and profit. Then he gets at his estimated increase of sale, and gives a figure which is to furnish him with an increased profit of £729. Then upon this he allocates the annual charge for interest and dividends at 5 per cent., on the money to be expended, £206, and shows a surplus profit for reducing the price of gas and increasing the dividend as per the sliding-scale of £523. Now, is he there, in effect, taking advantage of the capital that we have to find, and allocating everything over the 5 per cent. interest as profit upon the existing capital?

Witness: Certainly. If the principle is to be admitted, I do not see why you should not go on *ad infinitum*.

Though the Act provides that we shall repay the capital over-spent if our consent has been given to the expenditure, we do not want to rely upon the technical point that our consent has never been asked, and we are not relying upon it. But we do not want to have to re-pay the capital, and also the capitalized profit upon it?—I do not think that is what was ever intended under the Act. To my mind, the intention was that the Company should have the value of their undertaking, *plus* the capital expenditure which the Company had to make until they were taken over.

Is that the reason why, from the point of view of the clearness of accounts, you thought the year 1909 was the better one to take?—Yes. In the first place, it is the year within which the notice to treat is served. Of course, the accounts for 1910 were evidence of the possibilities of the undertaking, still those additional profits have been earned with a capital now to be repaid by the Board, and not by the Company's capital.

Examination continued: It was exceedingly hard, when once they got into 1910, to eliminate this difficulty. He had, however, prepared a statement showing what the capital expenditure from October, 1909, to Dec. 31, 1910, consisted of. The amount was £1694. Some of it was for meters; and if they had not been provided by this capital, the sale of gas would have been less. He handed in a balance-sheet to show what the position would be at the end of 1910. The effect was that the Company, after discharging the accounts indicated and paying the dividends, would be left with a balance of £2754 which they could not divide. This amount, therefore, he deducted from the £8923, leaving a net sum of £6169 as the over-spent capital that the Board would have to pay. In addition, of course, there would be refunded any amount spent since December, 1910, as well as the costs of the 1908 Act. If the Board were given this £2754, they would get in effect a working capital. He had prepared a statement of profit at Dec. 31, 1909, made out on the lines of his evidence. The figure arrived at, which included profit on fittings, was £1633. He had taken out the details that made up the total for repairs and maintenance of mains the last two years; and, so far as he was able to judge from these, it did not look as if there were any big system of overhauling.

In cross-examination by Mr. FITZGERALD, witness agreed that the sum of his evidence was that there was no entry or allowance in the accounts for depreciation of stoves and meters. It was a fact that in the form of accounts given in the Gas-Works Clauses Act no allowance at all was made for depreciation, except as to works on leasehold land.

Mr. FITZGERALD: You must be aware, as an experienced auditor and gas director, of the fact that the Income-Tax Commissioners on the Board of Inland Revenue have issued a regulation in regard to gas and water undertakings, that no depreciation shall be allowed in any circumstances in respect of any portion of the undertakings?

Witness: And we have fought the question over and over again; and over and over again the Special Commissioners have allowed it in spite of the circular.

And further than that, they have also issued this in their regulations: That all expenditure on repairs and renewals with corresponding extensions and improvements is to be charged and allowed as working expenses as and when incurred. Accordingly, if you charge all expenditure on repairs and renewals as working expenses as and when incurred, you carry out the provisions of the Act for the purposes of Inland Revenue?—Yes; for Inland Revenue purposes.

Then you agree that you are carrying out, are you not, the form of accounts given in the Act of 1871?—No; I do not agree. I certainly will not say for one moment that the form of accounts as prescribed by Statute prevents your charging depreciation.

You must know that it is quite common for gas companies to follow the form of accounts which the Act has prescribed?—I say I do not know a single gas company that does not write off depreciation of stoves. The Act tells you to arrive at what are the profits for the year, and to state your accounts in a certain form. I say that until you have made a proper reserve for depreciation at least of stoves, you have not arrived at the true profits of the Company.

You said in your evidence that for the year 1909 you charged £183 for depreciation of meters. I want to know on what sum the £183 was charged?—It is calculated at the ordinary 4 per cent. on £1785, and 6 per cent. on £1860. One figure I have raised by starting at the Company's capital account, and from 1904 charging-back as capital

all new meters bought. The other, by charging-back to the starting figure of 1904 on new meters bought since, and writing-off depreciation on the diminishing value.

Then, for the purpose of reducing our profits in a particular year, you have taken the capital expenditure since 1873 on meters, and calculated the depreciation on the whole of the capital expenditure extending over very nearly forty years. Do you not see that if you manipulate accounts in this way, you can prove anything?—I do not agree. I do not think there is any question of manipulation.

Cross-examination continued: He was writing off depreciation on diminishing value. There was nothing in the Act which put any obligation on the Company to provide working capital for the Board; but it entered into the calculations as to the value of the undertaking they were going to sell. Section 56 of the Act said the Board had to provide their own working capital; and they were authorized to borrow for this purpose such sums as the Local Government Board might sanction. As to the Company's accounts, if, instead of taking the profit at Dec. 31, 1909, he had taken it at Dec. 31, 1910, he would have produced an entirely different result, and one much more favourable to the Company. The total result of his table was that he had brought the income of the Company for 1909 to a less amount than the sum actually paid in dividends that year, though, in fact, a small balance was carried forward after payment of the dividends. He had proceeded on the basis that the undivided profit in cash would go to the Board.

Mr. VESEY KNOX (in re-examination): What you are really proposing to do when you allow for depreciation of stoves and meters is to put down against the profits of the year that which you know will have to be paid for, if not now, in a year or two, in the form of renewals?

Witness: Certainly.

Therefore it is the opposite thing to a suspense account, which the Company have provided, though there is no express authorization for any suspense account in the Act of 1871?—That is so.

Then my learned friend put to you that the Board of Inland Revenue have tried to prevent an allowance for depreciation by gas companies in this way; and I think you said that this point had been fought before the Special Commissioners for Income-Tax?—It has certainly been fought before the Special Commissioners. It has never been fought in the High Court yet; but I believe, it shortly will be tested. I may say I am dealing with this question of income-tax, not only with gas companies, but with all trading undertakings. The Inland Revenue Commissioners will only allow certain deductions for depreciation, which in a great number of cases are nothing like adequate, and nothing like what a prudent man would put on one side, or what an accountant would allow for if he were certifying for the profits of a trading business.

Mr. *A. J. Thomson*, in answer to Mr. VESEY KNOX, said he was Manager of the Manvers Main Collieries, Limited, who owned most of the coal which was being worked in Swinton, and a large part of that which was being worked in Mexborough. His Company had worked the Barnsley seam under part of the land of the Gas Company. He had been informed that the gasholder had subsided. In this district subsidence might continue for anything up to twenty years after the working of the seam. It was five years since the coal was first worked under the gasholder; and it took two years to do. Up to the present, his Company had not worked the coal under the canal; but if they did so, he certainly thought it would have a further effect upon the surface. So far, they had not acquired the right to work this coal; and nobody else had any right to do so. Under the Barnsley seam was the Parkgate seam, which was let to his Company. No doubt this seam also existed under the gasholder; and when it was worked, the holder would be in a very risky position, if not protected. He agreed with Mr. Longbotham that the expense of buying the portion of the Parkgate seam under the gasholder would be prohibitive. There was a spot about 100 yards from the present holder where it would be perfectly safe to put up a new one.

Mr. FITZGERALD called for the production of the lease under which the Manvers Main Company were working.

Mr. VESEY KNOX said he had never seen it, and so could not produce it. The matter was not within his control, or in the control of the witness either.

Mr. FITZGERALD: At present there is no evidence whatever that the Parkgate seam under the gasholder belongs to the Manvers Main Colliery Company or anyone except Lord Fitzwilliam.

Witness: It may not be let exactly under the gasholder.

Cross-examined by Mr. FITZGERALD, witness said he thought that if the gasholder went down, his Company would be protected by the terms of their lease. He did not admit that it was because he wished to get rid of their liability in the matter that he suggested the holder being put upon another site. The Gas Board had requested him to look into the question of another site. He did not believe his Directors had considered the question of their liability if they let down the gasholder.

Fourth Day.

Mr. *Charles Hunt*, examined by Mr. VESEY KNOX, said he had inspected the Company's works and area of supply. The only fault he had to find with the site of the works was in connection with the mining subsidence. Having regard to this risk, he should say that rather less than one-half of the 2½ acres was suitable for gas-works.

Mr. FITZGERALD, at this point, said he had the most definite information that the Parkgate seam under the gas-works was not leased to the Manvers Colliery Company.

Mr. HARRY JONES: As long as the coal is there, there is a chance of its being worked out by somebody.

Mr. FITZGERALD: Yes. I agree there is a chance of its being worked; and that is the way to look at it.

Examination continued: The retort-house was in fair condition; and there was a coal-shed adjacent to it of a capacity equivalent to five or six weeks' maximum consumption. It was a slight structure, without any brickwork. No value could be attached to the two old settings of retorts; and they should be either written off the capital account or the new ones should be charged entirely to revenue. Three new settings were put in; and then a fourth was added, which was really necessary in order to safely maintain the present production. According to the actual production last winter, with the new retorts there was a margin (after allowing 15 per cent. for repairs) of 16 per cent. He did not regard the condensing plant as being sufficient; and there ought to be an additional exhauster to ensure regular working, in which case the house would have to be enlarged. The scrubber was evidently too small for the present production of gas. When he visited the works, a purifier had just been emptied; and the oxide reeked with ammonia—showing that no real attempt was made at that time to properly purify the gas from ammonia. This would affect the amount of liquor available for sale. With the scrubber working as he saw it, the yield of liquor would be very low. The purifiers he considered should be renewed entirely. The smaller gasholder was completely worn out, and could not have been in use for a considerable time. The crown plates were riddled with large holes. The tank did not appear to be water-tight. As to the larger holder, its present condition precluded the possibility of another lift being added to it with any degree of safety, and placed in serious jeopardy the continuity of the gas supply. In January, 1910, he found the cast-iron tank of the holder to be out of level to the extent of 7¾ inches; and in January of this year he made another measurement, when it was 9¾ inches out of level. He understood subsequent measurements seemed to show that the subsidence was continuing. In addition to what had already been stated in evidence, he found two of the channel-guides fractured at the bottom. Supposing the subsidence went on, the only thing to do would be to either take down the holder and re-erect it on another site or provide an entirely new holder on sound ground. It would not be economical to re-sheet the small holder. The money would be better spent on a much larger holder. The storage capacity was now actually deficient. The works certainly on the occasion of his visit in 1910 showed grave neglect as regarded their upkeep, especially with respect to what he called the derelict gasholder and the purifiers. Then the leakage of gas was extremely high, even for a mining district. He had made an examination of the mains at different points; and he gathered from this that the heavy leakage was to be accounted for partly at any rate by the mains having originally been badly laid. Fifteen openings were made; and in seven of them the joints were leaking. In two other cases, though they detected no leakage, the ground was found to be impregnated with gas. Many of the pipes had turned and bored joints; and none of them were made with a recess, which was frequently resorted to, so that in the event of trouble with the joints they could be run with lead. The pipes being laid as they were, it would be necessary either to relay them or to use split collars at each joint to stop the leakage. In one instance, at least, he saw the pipe had not been driven home in a straight line; and this led him to fear that the pipes were not properly laid at the outset. He estimated that at least £6000 would be required to put the distributing mains and services in good condition. There would, he took it, then be a reduction of one-half in the leakage, and perhaps a small additional consumption. So he deducted from capital value only one-half of this amount, or £3000. About one-half of the sum he had named would be represented by replacing the small pipes with 3-inch mains. The following schedule was submitted by witness giving particulars of the deductions he claimed from capital value for dilapidations and deficiencies: New purifiers, £900; new gasholder, 241,000 cubic feet capacity, to replace existing one, including foundation, £3650; land for same and connections, £1000; one-half cost of overhauling mains and replacing small ones with 3-inch, £3000—total, £8550. He had not included in this a certain number of small matters. His table of amended profit for the year 1909 was as follows: Gross profit as shown in the accounts, £2353 14s. 5d.; add gratuity to old servant, £18 11s.; total, £2372 5s. 5d. Deduct excess credit for tar, £49; underspent on repairs and renewals, £58 10s.—total, £107 10s. Gross profit amended, £2264 15s. 5d. Deduct interest on mortgage, £270; interest on bank overdraft and cost of 1908 Act, £455 17s.; interest on overdue account, £37 5s.—total, £763 2s. This left a net profit of £1501 13s. 5d. Having gone carefully into the question, he considered that 7d. per 1000 cubic feet in this case would be a fair allowance for repairs, maintenance, and renewals of works, mains, services, meters, and stoves. He had also considered the 1910 accounts, and admitted that there was a good deal of improvement. A statement of amended profit for the year 1910 was as follows: Gross profit as shown in the accounts, £2722 4s. 2d.; and gratuity to old servant, £18 11s.; excess expenditure on repairs and renewals, £36 12s.; for wages, £29 4s.; tar and liquor, as per Mr. Stevenson's statement, £277 4s. Gross profit as amended, £3083 15s. 2d. Deduct interest on mortgage, £270; interest on bank overdraft and cost of 1908 Act, £504; interest on overdue account, £37 5s.; total, £811 5s. This left a net profit of £2272 10s. 2d. Next he had gone into the question of what the returns for residuals were during a period of six years to 1910. The increased return per ton of coal carbonized in 1910 over 1909 was: Coke, 1s. 0·8d.; tar and liquor, 1s. 2·1d. This was a total increase per ton of coal of 2s. 2·9d., which, on 4103 tons, represented £460. He did not think the figure of profit shown in 1910 was maintainable, on account of this exceptionally high return from residuals. If he were to deduct the £460 increase from the £2272 net profit for 1910, there would be about £1800 left; and this would leave, taking the two years 1909 and 1910 together, an average profit of £1650 in round figures, subject to the liability to make up the worn-out plant and deficiencies. On this basis, he had prepared a valuation, in which he multiplied the £1650 by 20 years' purchase, making £33,000, and deducted £8550 claims for worn-out and defective plant—leaving £24,450. To this would have to be added the following items: Expenses of reinvestment (loss of interest, stamps, and brokerage), overspent capital, &c., as per Mr. Cash's statement, mortgage to be taken over, the payment for stocks, and the taxed costs of the 1908 Act.

Mr. VESEY KNOX: Why have you adopted 20 as the multiplier in the case of this undertaking?

Witness: I took the particulars from the "JOURNAL OF GAS LIGHTING" showing what the yield upon investment would be of all the companies quoted weekly in that paper for April 4 last, with the exception of the Bournemouth Company, which is a water as well as a gas undertaking.

What did it show as the average number of years' purchase according

to the market valuation?—Of sliding-scale companies, the average is 20·94 years; and of the maximum-dividend companies, 22·23 years.

What is the variation in the case of the sliding-scale companies between the highest and the lowest?—23·21 is the highest (that is Newcastle); and 18·79 is the lowest.

Were the undertakings of very much larger size than this?—Yes, much larger; representing many millions of capital.

Mr. FITZGERALD (in cross-examination): Gas stocks have been appreciating, have they not, in the course of the last twenty years?

Witness: Not as compared with twenty years ago.

I notice that in the Stourbridge gas arbitration (that was in the year 1893), you capitalized the dividends at 31 years' purchase?—Yes; I think so. The value of money was much more than it is now.

But the return from gas stocks was higher than it is now?—I do not think so.

I will take a leading case like the Gaslight and Coke Company. The table you have put in shows that the return on this Company is now £4 7s. 7d. In 1893, it was £5 8s. 1d. You are, as we know, Chairman of the South Suburban Company. The table shows the South Suburban's present return is £4 13s. 6d. In 1893, it was £5 4s. 2d. I put it to you, therefore, with some confidence, that in 1893 the return from gas stocks was higher than it is now?—If those figures are typical of the gas stocks, I admit it. The Stourbridge case was rather exceptional.

With regard to retorts, where you are renewing existing work, if you are putting in work of a better and more expensive character, you do charge some portion to capital, do you not?—Not if you do not increase the productive capacity.

As to repairs and renewals, do you observe that by debiting the Company with £3000 for repairs of mains, you are putting another 1d. on; so that you are really charging 8d. here?—No; I do not see that. You have to put the mains in proper condition first, and then the annual expenditure (7d.) will keep them so.

It is obvious, from your putting in the table for 1910, that you agree that the considerable extra profit earned in 1910 is one of the factors to be taken into account in arriving at the value of this undertaking?—Yes; I do.

Mr. VESEY KNOX (in re-examination): It has been put to you that there are certain companies, selected by my learned friend, in which there was, in fact, a larger return on the price in 1893 than on the price of to-day. Was that an altogether exceptional thing?

Witness: So far as I know.

Mr. FITZGERALD: You can take all the companies, and you will find it is the same thing.

Mr. CORBET WOODALL: Taking this list which you have put in, would you expect, assuming it to be possible from other points of view, that you could go into the market and buy the whole undertaking at the rate shown in your table?

Witness: I do not know that you could.

The UMPIRE (referring to the figure for putting the mains in order, &c.): In respect of what do you charge only £3000 as against the Company, instead of the £6000 which is the total expenditure?

Witness: Because something will be saved—I cannot tell what. I thought that would be a rough allocation.

Apart from the question of saving, out of this £6000 you are putting down a number of mains larger than those at present. This will add to the capital value of the Company. There is no allowance for that in the £3000?—There is no allowance, beyond the fact that I have halved the amount.

Mr. *Cash* was re-called at this point, and stated that he had agreed with Mr. Keen a memorandum as to adjustment of revenue from sales of tar and liquor in 1909 and 1910. As to tar, the result was to make a deduction from the profit of 1909 of £49, and an addition to the profit of 1910 of £104, if the prices at which the Company took stock were accepted. If the stocktaking price were altered to the average price per ton realized the following year in each case, the result would be: In 1909, add to profits £4 17s. 3d.; and in 1910, add to profits £74. With regard to liquor, on the basis of a make of 14 gallons of 14 oz. liquor per ton of coal carbonized, and assuming this quantity to have been sold at the contract price, the result would be: In 1909, add to profits £81 8s.; and in 1910, add to profits £75 3s.

Mr. *Frank H. Jones*, examined by Mr. HONORATUS LLOYD, said that until the last two years the amount the Company had spent upon the undertaking had been most inadequate. The condition of the works showed this, as well as the balance-sheet. He had prepared a valuation the figures of which agreed with those given by Mr. Hunt, with whom he went into the matter carefully. Having regard to all the circumstances, it was fair to take £1650 as the maintainable income; and 20 years' purchase was a fair multiplier to take for this Company. It was an undertaking which was selling a smaller amount of gas than ten years ago for a larger capital; and undoubtedly it had been proved to be badly managed and badly maintained. With two exceptions, the works were sufficient for the purposes of fairly earning the income. Probably they would not have to incur any big expenditure except for purifiers and a gasholder. When he saw the works on Jan. 21 of this year, the gasholder tank was about 10¼ inches out of level. The holder itself was absolutely level. From what had been said, it appeared to be a most dangerous structure. The proper course was to build a new holder on safe ground. It would be very unwise to spend £300 on repairing the small holder. He felt certain the tank leaked considerably. The cost of the work on the mains he had also agreed with Mr. Hunt. The mains themselves were generally in good order; but a great many of the joints were leaking.

Cross-examined by Mr. FITZGERALD: His valuation was on the same basis as Mr. Hunt's, with the exception that Mr. Hunt had allowed a blank sum for interest on money and the cost of reinvestment, and he had not. Since 1908 the Company might have been improving their position, but only with a view, he thought, of this tribunal settling a price. He did not pretend for a minute there was not a very large future for the undertaking. If the income increased, the price of gas could be reduced, and a bigger dividend be paid; but the price had not been reduced. He had not made any allowance at all, either in the number of years' purchase or in any other way, for the increased income that would probably be earned. He had dealt with the price of gas as it was to-day, and as it had been for some time. The undertaking could reduce the price, and should reduce it, 6d. per 1000 cubic feet.

Re-examined by Mr. HONORATUS LLOYD: Whatever improvement there had been quite recently had been out of capital which the Board had to repay.

The UMPIRE: Does your £3000 for putting the mains and services into a proper and safe condition represent the same amount of work as Mr. Hunt spoke about?

Witness: I think it does. I think Mr. Hunt includes increasing certain mains. I should not like to say for certain.

He did. He distinctly said that a considerable proportion of the £6000 was for substituting something larger than 2-inch mains. Is there anything of the sort in your figure of £3000?—No; I think if you increase the mains that is a fair capital charge.

Supposing the amount necessary to put the undertaking in a satisfactory position was spent by the Company to-day, have you considered what number of years' purchase you would then allow?—I should not allow more than 21 or 22 years then at the very outside—not for this scale of company, and with its history.

Mr. HONORATUS LLOYD here announced that since the morning he had received information that the Parkgate seam under the Swinton Gas-Works was leased to Messrs. John Brown and Co. for forty years from March, 1891. No one, he added, had suggested that it had yet been worked.

Mr. *John Wilkinson*, of Halifax, was next examined by Mr. HONORATUS LLOYD, and said that when he visited the works in January, 1910, they were in a very bad condition. He did not consider that the plant generally was in excess of present requirements. The purifiers were deficient both as to size and condition; and neither the condensers nor the tower scrubber was quite equal to the existing output. As to the bigger gasholder, on Jan. 15, 1910, the tank was 7⅜ inches out of level; and on Jan. 21 last, 9⅝ inches. Then on March 18 measurements indicated that it was 10 inches out of level. The tank was still moving; and its future was uncertain. Another gasholder should be erected on a fresh sound site. He had tested the pressures on the district; and some of them were insufficient for present-day requirements. The initial pressure at the works had also been taken by him on the same night; and it was 28-10ths. The governor was in operation. To furnish a satisfactory supply would necessitate an absolute overhauling and renewal of the distributing system. The only way in which they could stop the leakage from the joints of the mains was by putting a clip on them; and this would cost more than commencing at the beginning and completely stripping the lot and laying new ones. Therefore the only reasonable way to tackle the job was to do so in sections from the works, and to relay the whole of the system with iron lead-jointed pipes. Witness handed in the following statements, showing the necessary adjustments to determine actual net profits: Gross profits for year ended Dec. 31, 1909, £2353 14s. 5d.; less profits on fittings, £65 9s.—£2288 5s. 5d. Deduct under-spent on repairs, renewals, and maintenance of works, mains, meters, and stoves (being the difference between 7d. and 6·6d. per 1000 cubic feet of gas sold), £56; allowance for law charges, £10; under-charged for inspection of meters and collection, &c., £17; interest on mortgage, £270; interest on £7491 bank overdraft, £336 18s.; and interest at 4½ per cent. on £828, being value of meters, &c., purchased in 1908, but not yet paid for, £37 5s.—total, £727 3s. This left a net profit of £1561 2s. 5d.; add profits on fittings, £65 9s.—making the total £1626 11s. 5d., as against the maximum dividend of £1650. In valuing the undertaking he multiplied the standard dividend of £1650 by 20 years' purchase, giving £33,000; and from this he deducted £8750 for worn-out and deficient plant, leaving £24,250. The blank items he left were: Add for expenses of reinvestment, loss of interest, stamps, and brokerage; and add balance payable to the Company in respect of over-spent capital, &c., as per statement to be submitted by Mr. Cash. The sum of £1650, he said, was the full amount the Company could earn with ordinary prices ruling in an ordinary year. The year 1910 was not a normal one, because of the largely increased price obtainable for coke, tar, and liquor. The price of 4s. 2d. per 1000 cubic feet to prepayment consumers was not one likely to bring a great rush of business in a district like Swinton.

Mr. FITZGERALD (in cross-examination): Do you venture to tell the tribunal that your charge at Halifax for repairs, renewals, and maintenance of works, mains, meters, and stoves comes to anything like 6·6d. per 1000 cubic feet of gas sold? Putting the sinking fund aside, your charge is less than 6·6d., which we are allowing?

Witness: If you exclude the contribution to the sinking fund, it is less, undoubtedly. But I maintain the sinking fund is used.

Where you are dealing with the profits for the year 1909, you bring them out at £1626. But you have not taken into account the adjustments made with regard to the tar and liquor by Mr. Cash and Mr. Keen. This would have increased the figure?—It would have increased it; but I say that adjustment is not proper.

You are proposing to give us £24,250, and that represents exactly 14·8 years' purchase of our maximum dividend?—That is after allowing for the amount claimed for deficiency. You have taken off the amount that we are claiming for deficiencies.

That means that, according to your valuation, we should receive 14·8 years' purchase of our maximum dividends, which we have been receiving for years?—Yes; but you have been receiving them at the expense of the undertaking.

This concluded the evidence; and it was arranged to meet on the following day to hear the speeches of Counsel.

Reductions in Price.—The Bath Gas Company make a reduction of 1d. per 1000 cubic feet in the price of gas; bringing it down to 1s. 10d. as from Midsummer. At Arbroath, the price of gas to ordinary consumers has been reduced from 2s. 8½d. to 2s. 6d. per 1000 cubic feet; and to those using gas for power purposes, the charge will be 2s. 3½d. The Llandudno Urban District Council have lowered their price 3d. per 1000 cubic feet.

INSPECTION OF GAS-LIQUOR AND OTHER WORKS UNDER THE ALKALI ACT.

District Inspectors' Reports.

In another part of the "JOURNAL," the report for the past year of the Chief Inspector under the Alkali Works Act, 1906 (Mr. W. S. Curphey), is dealt with. We give here some extracts from the reports of the District Inspectors.

The first district is Ireland, which is under the supervision of Mr. E. G. Ballard). He says the works for the manufacture of sulphate of ammonia there are numerous, and, on the whole, are well conducted; the various plants being maintained in a good state of repair, and no complaints having arisen. Much more care was taken at one works mentioned in last year's report as unsatisfactory; and there has been no reason to find fault with the manner in which the works have since been carried on. Taking all the places where sulphate of ammonia is made in Ireland, the number of works absorbing the sulphuretted hydrogen in oxide of iron is 37; the number burning it, 3; the number working on the continuous system of distillation, 34; and the number working on the intermittent system, 6. The proportion of total liquor distilled by the continuous and intermittent systems was 99·4 and 0·6 per cent. respectively. The proportion of sulphuretted hydrogen treated by various methods, in terms of sulphate made and per cent. of total make, is as follows: By oxide purification, 89·4; precipitated by metallic salts, 10; burnt, 0·6. Products equivalent to 3081 tons of sulphate of ammonia were made during the year. In places where tar is distilled, Mr. Ballard says ample provision is made for dealing with the noxious vapours evolved at certain stages of the process, either by burning the gases or by absorption in oxide of iron. Where tar is heated for the manufacture of roofing felt, the works are so arranged as to meet the requirements of the Act. There were no complaints throughout the year.

In the North of England district, which is under the supervision of Mr. E. Morley Fletcher, three new works for the manufacture of sulphate of ammonia were added to the register. One was an ordinary gas-works, and the other two were coke-oven works, with recovery of bye-products. There was considerable extension of this latter class of plant during the year, and the quantity of sulphate of ammonia derived from coke-ovens has doubled itself in the last five years. In several coke-oven works, the direct recovery of the ammonia has been adopted, whereby much of the cooling and scrubbing plant, with subsequent distillation of the ammoniacal liquor, is dispensed with. The total quantity of liquor distilled, equivalent to sulphate, was 51,388 tons; and the proportion distilled to liquor ammonia was 0·68 per cent. The proportion of sulphate made by the continuous processes was 99·9 per cent.

Reporting upon the district comprising Cheshire, North Wales, and part of Lancashire, Mr. Ballard states that there were registered in the district three works where gas liquor is concentrated for sale and employment in various manufactures; and all such works were carefully carried on. There are other works where the liquor is dealt with in the manufacture of ammonia soda; and they were all well conducted. On the whole, the works in which sulphate and muriate of ammonia are produced were, Mr. Ballard says, carefully carried on. In one case, neglect of a strict supervision of the oxide purifiers was apparent in November last, and necessitated a formal letter from the Chief Inspector with regard to the matter. Improvements were carried out, and the works are now on a satisfactory footing. The various sulphate of ammonia plants elsewhere in the district have been maintained in a good state of repair; and the manufacturers have displayed every care to meet the requirements of the Act. All the stills in the district, to the number of 22, are on the continuous principle of distillation. In the manufacture of sulphate and muriate of ammonia, sulphuretted hydrogen is evolved; and the principal method by which this is dealt with is by absorption in oxide of iron. All the tar-works in the district were efficiently carried on.

In the district comprising Widnes, Runcorn, and Liverpool, which is under the supervision of Mr. Herbert Porter, the number of works dealing with gas liquor and sulphate and muriate of ammonia was the same last year as before. All the plant was properly worked and maintained; while at one works entirely new and larger plant was erected. The former remark applies generally to tar-works, of which there are six in the district.

The district of North and East Lancashire, which includes part of Yorkshire, is under the supervision of Mr. Harold J. Bailey, who has succeeded Mr. J. W. Young, now the District Inspector for Scotland. There were 52 works registered last year for the treatment of gas liquor and sulphate and muriate of ammonia; sulphate being produced at 46, liquor at 11, and muriate at one. The proportion of ammonia made by continuous distillation was 89·8 per cent. of the whole, calculated as sulphate. Generally the works were carried on with freedom from nuisance, though Mr. Bailey says in some cases more frequent attention to purifiers is required. Heap purifiers continue to give satisfaction; and no cause of complaint has arisen where these are installed. During the past year, there were 26 works registered for the distillation of tar. In two instances the foul gas from the worm-end is absorbed in oxide of iron; but in all other cases it is destroyed by combustion.

The number of works on the register at the end of the year for the East Midland district, which is under the supervision of Mr. R. D. Littlefield, was 136, or three less than in the preceding year. There were, however, 198 separate processes under inspection, compared with 196 in 1909. There were 59 works registered for the manufacture of sulphate and muriate of ammonia and the treatment of gas liquor—eight being for the last-named purpose. During the year, a new bye-product coke-oven plant, in which the free ammonia in the gas is absorbed by the direct method, was successfully inaugurated. Sulphate of ammonia is made at 50 works—in 48 of them by the continuous process, and in two by the intermittent process. The proportion of liquor distilled by the former process amounted last year to 99·4 per cent. of the whole. The production of sulphate of ammonia from coke-oven works increased considerably last year; and Mr. Littlefield says there are indications that it will be further extended in the near future. The output of tar in the district is constantly augmenting; and several new plants are under consideration.

In the South Midland and Norfolk district, which is under the supervision of Mr. Edward Jackson, there are 107 works registered where either ammonium sulphate, chloride, or carbonate is manufactured or gas liquor concentrated. This is an increase of three works for the year. The total number of separate processes under inspection where these ammoniacal products are manufactured now reaches 117. The three new works registered last year were all for the manufacture of sulphate of ammonia. At one of them, plant has been erected at an ordinary gas-works; and a continuous still, with the usual fishing saturator, has been put in. One of the other new works was in connection with bye-product coke-ovens. The plant is of the usual type at these works—viz., a continuous still, with fishing saturator and iron pipe condensers. The saturator gases are finally passed into the condensers and scrubbers of the coke-oven gas plant—the plan now generally employed at this class of works. The total acidity of the chimneys was found not to be raised to any important extent by this method of treatment. At the third new works, an interesting plant has been erected by Mr. George Wilton at a small gas-works carbonizing about 2000 to 2500 tons coal a year.* The plant, which Mr. Jackson says appears to be quite suitable for works of larger size, has been designed to meet the difficulties so often experienced in small works in dealing satisfactorily with the ammoniacal liquor, and particularly the constantly increasing trouble arising as to the disposal of the effluent, mainly on account of the sulphocyanides and phenols which it contains. Such works are usually situated in country (agricultural) districts, where this effluent is more difficult to get rid of without nuisance than in busy manufacturing centres. Mr. Wilton states that the effluent is reduced by one-fourth, compared with the ordinary sulphate of ammonia plant; and the small quantity produced at the works in question is evaporated in shallow pans placed over the retort-benches. The process also considerably reduces the chances of nuisance, from an administrative point of view, in connection with the Alkali Act, as, by the decomposition of the sulphides of ammonium in the acid washer, the sulphuretted hydrogen goes on with the crude coal gas to the ordinary purifiers. Plant is now in course of erection in the district on the lines of one of the methods recently proposed for the direct recovery of sulphate of ammonia from coal gas by utilizing the sulphuretted hydrogen which it contains to make the sulphuric acid required. Mr. Jackson characterizes this as "a process with great possibilities;" and he says it will be extremely interesting to watch the development and working of the cycle of reactions by which the result is obtained. Mr. Jackson gives the following figures showing the proportion of ammoniacal liquor produced from various sources in the district on a sulphate of ammonia basis:—

	1909. Per Cent.		1910. Per Cent.
From gas-works	54·9	..	51·2
,, coke-ovens	34·0	..	35·2
,, producer-gas plant	6·9	..	9·9
,, iron-works	2·8	..	2·3
,, coal-carbonizing works	1·4	..	1·4

There was an increase in the production of ammoniacal liquor in the district last year of 10·3 per cent. compared with the 1909 figures. Of this additional production, coke-ovens and producer plants contribute 8·5 per cent.; the gas-works increase only amounting to 1·8 per cent. The number of works using the continuous method of distillation last year was 101; the proportion of liquor distilled being 99·7 per cent. At eight works, the liquor is obtained from special processes, and does not contain any sulphide of ammonium; the sulphur present being oxidized. The gases from the saturators in some cases are, however, burnt, to destroy the offensive tarry (phenoloid) smell before escaping. No sulphuretted hydrogen is generated from the ammoniacal liquor distilled in several works. It amounts to 12 per cent. of the total production. The tar-works in the district have increased to 38 registrations. There were no important alterations made last year for dealing with the offensive vapours arising during the process of distillation. In one-half of the works, the combustion method is in use for rendering the worm-end gases inoffensive before being discharged into the atmosphere. In the other half, lime and oxide of iron purifiers are usually employed to arrest the noxious gases. Two new plants were registered. One was in connection with bye-product coke-ovens; and at the other, tar of an exceptional quality from a Mond-gas plant is distilled.

In the South and South-West of England district, which is under the supervision of Dr. Alfred C. Fryer, there are 96 registered works where the manufacture of sulphate and muriate of ammonia is carried on. One new works was registered last year for the manufacture of sulphate of ammonia. It has a continuous still, hand-fishing saturator, and water-cooled iron pipe condensers; and the sulphuretted hydrogen generated in the process is absorbed in a heap of oxide of iron. New sulphate plant, with the usual continuous stills and hand-fishing saturators, was put down in one works, replacing an intermittent distillation plant; while in two others, new sulphate houses and still were erected. New saturators replaced old ones at seven of the plants; and in four works new oxide of iron purifiers have been built. One works was complained of during the early part of the year. The Directors and Manager met a deputation of the Town Council, together with the Town Clerk, the Medical Officer of Health, and Dr. Fryer. After full consideration of the matter, it was apparent that the sulphate of ammonia plant was not to blame, but the vapours complained of came from the destructor chimney, as those responsible for the working of the town destructor had been relying for their temperatures on readings from a faulty pyrometer. In one works some sulphuretted hydrogen was found to be escaping from cracks in the sides of a brick oxide of iron purifier. The purifiers had not been constructed originally on the best method; and the Manager therefore took the opportunity of building an outer wall, set in cement, round both purifiers, leaving a cavity which was filled in with pitch.

In the report for 1909, attention was directed to an interesting

* Some particulars as to this plant will be found in the "JOURNAL," Vol. CXII., p. 474.

experiment carried out at a small gas-works in the South of England, where coal gas was bubbled through dilute sulphuric acid, and the solution evaporated down with a steam-coil to obtain crystals of sulphate of ammonia. Dr. Fryer points out that in many small gas-works no attempt is made to recover the ammonia from the gas. The water in the purifier lutes and gasholder tanks is converted in time into weak liquor; and consequently the gas becomes charged with free ammonia, while the weak liquor made upon the works cannot be disposed of, as the cost of carriage is prohibitive. Hitherto no plant has been devised which is sufficiently simple and inexpensive to allow of its adoption in small works. Dr. Fryer has therefore watched with considerable interest the experimental plant at Wareham described by Mr. Moon in the paper read by him before the Southern District Association of Gas Managers last November, to which reference has already been made in a foot-note. Having offered some observations on this plant, he refers to that at Dunstable, and states that the method is being further extended by the erection of a larger installation at the works of the Woking Gas Company. He says these larger plants are more satisfactory, inasmuch as they aim at collecting and utilizing the whole of the ammonia driven off from the coal. Indeed, it is considered that the opportunities for leakage of ammonia are much less than with the usual arrangement of plant, seeing that storage-tanks for liquor, in the ordinary sense, are dispensed with—the working-up of the whole of the ammonia taking place continuously as it is produced. The plants are furnished with a direct-fired still, whereby the whole of the ammonia is recovered, so that a better technical result is obtained, at the cost of an increased capital outlay and greater cost of working. Dr. Fryer adds: "Although this new method of sulphate of ammonia manufacture is suitable for larger works, yet it is probable that it will be appreciated by smaller works isolated in position, but placed in the midst of agricultural districts where the local sale of sulphate of ammonia is advantageous. The Wareham method, with its low initial capital cost, and ease of operation without the necessity of any great amount of attention, will be a boon to those smaller gas-works where considerable difficulty is experienced in the disposal of gas liquor. It is, therefore, probable that the manufacture of sulphate of ammonia will now be carried on at many of those smaller gas undertakings where hitherto there has been little hope of making a profit by its introduction."

Dr. Fryer says the increased production of ammoniacal salts in the last 26 years is very marked. There are now in his district 96 works where these salts are manufactured; while in the year 1884 there were only 48 on the register. The actual increase since that date of ammoniacal salts, calculated as sulphate of ammonia, is 52 per cent. The number of works in the district in which continuous distillation is employed is 75; and the proportion of liquor treated by this process is 96·3 per cent. The distillation of tar is carried on at eight works; and the exit gases are efficiently dealt with—in three cases by combustion, and in the others by absorption in oxide of iron.

In the South Wales and Monmouthshire district, which is supervised by Dr. T. Lewis Bailey, the manufacture of sulphate and muriate of ammonia was registered at 15 works last year—ten being works for treating gas liquor, and the remainder coke-ovens with bye-product plant. Sulphate plants are in course of erection at three gas-works where hitherto none have existed, and one new coke-oven plant was, at the date of the report, expected to be soon ready for registration; two others being in contemplation. Dr. Bailey says the plant continues to be maintained in good working order on the whole, though it has occasionally been necessary to call attention to minor structural defects, and to emphasize the need for closer supervision in connection with the treatment of foul gases. "A point which perhaps calls for special mention is the cooling of the foul-gas main communicating with oxide of iron purifiers. When this is effected in a water-tank, more attention is needed to the water supply than is sometimes given; the result being an insufficient cooling of the gases prior to their entry to the purifiers. Where cooling-tanks have been superseded by a spray-cooling of the pipes, considerably improved results have been obtained—the heated water in such cases being carried away as produced." The total amount of ammonium salts, in terms of sulphate of ammonia, produced during the past year shows an increase of practically 6 per cent. over the previous twelve months; and it is anticipated that future years will show a still further increase, especially as considerable attention is being given to the manufacture of sulphate, and there is every likelihood, as pointed out by Dr. Fryer, of simpler processes being introduced, which will be suitable for smaller works in outlying agricultural districts from which freights make the transit of gas liquor an impossibility. The number of works using plants for continuous distillation last year was 14; and practically the whole of the liquor was treated by the continuous process.

As usual, Mr. F. Napier Sutton has much that is of interest to say about his work in the district comprising the eastern and south-eastern counties, in which there are 11 alkali and 175 scheduled works—a total of 186, or four more than in 1909. One is for the manufacture of sulphate of ammonia. The 89 works concerned with the distillation of gas liquor mainly produce sulphate; but carbonate and nitrate of ammonia, liquid (concentrated and refined), and anhydrous ammonia continue to be made as hitherto. The total quantity of ammonia compounds produced shows an increase of 1160 tons (in terms of sulphate) compared with the year 1909. The gas-works belonging to statutory companies and local authorities made 90·6 per cent. of the products; the balance of 9·4 per cent. having come from the works of private firms. Nearly the whole of the gas liquor was treated by continuous methods of distillation; and only five small intermittent distillation plants now exist in the district. The proportion of saturator gases utilized for the direct manufacture of sulphuric acid showed an increase of 3·7 per cent. last year, and is now 59·1 per cent. of the whole. The Claus sulphur-recovery process is in use in ten works; and the proportion of gas treated is 16·8 per cent. This shows considerable reduction; but Mr. Sutton says it is mainly due to the treatment of less liquor by the Hills desulphurizing process at one of the works in the district. The most recently erected Claus plant has yielded the best return of sulphur per ton of sulphate made; and the recovered sulphur is of exceptionally good quality. This, it is thought, may be due to the position of the kiln, which is placed above the main depositing chamber, and the sulphur vapour passes directly downwards into this. Mr. Sutton considers it to be a great improvement on the usual design where the kiln is placed at the end of the chambers, and is less likely to cause blockage by the deposit of sulphur at the outlet. At 61 works the foul gases are absorbed in oxide of iron, either in "heap" form on a concrete floor or in open box purifiers; and 13·2 per cent. of the gases is thus treated. This system is in use at 31 works; and the extension of it is recommended as being more efficient, simple, and less costly in labour than the box purifiers. Mr. Sutton makes the following remarks on this subject:

> It is well to draw attention to the importance of proportioning the area of gas distribution within the oxide to the size of the heap. It has sometimes been the practice to simply cover the gas-inlet pipe with a hood or plate, and to place a cone-shaped heap of oxide over this. Through such an outlet, the velocity of the gas is such that it quickly forces its way to the surface by a confined path; fouling the oxide in a limited area, and leaving much absorbing material untouched. By placing two, four, or more grids supported on bricks over the gas-inlet pipe, and covering with a plateau-shaped mound of oxide, the gases are brought slowly into contact with an increased area of material, and absorption is spontaneous, general, and complete.

The saturator gases are burnt in a special furnace, with subsequent neutralization of the acid products, at eleven works; and 9·7 per cent. of the gas is thus accounted for. At two of these works, the neutralizing plants are used in conjunction with the Radcliffe process for the treatment of spent liquors from the stills; and here the neutralization is not so efficient, Mr. Sutton states, as in other cases, on account of the limited quantity of water used on the scrubbing-towers. At two works, the saturator gases continue to be passed from the sulphate plant to the foul coal-gas main, and so on to the purifiers.

In the report for 1909, Mr. Sutton called attention to the advantages of using a continuous lime feed on the liquor-stills; and he says the remarks then made have led to the adoption of the principle at several works, which has resulted not only in better yields of sulphate, but in the reduction of the amount of lime used. At one works, the increase of salt since obtained has been very marked. The observations made on the comparative cost and value of caustic soda and caustic lime as decomposing agents of the fixed ammonia salts likewise aroused some interest, and stimulated the users of caustic soda to look more closely into the matter. Periodical complaints, extending over some years, have been made of noxious smells alleged to arise from the gas-works of a popular seaside town. The works are awkwardly situated in the heart of the town, with good residential property at higher levels on two sides. The onus was placed upon the sulphate of ammonia plant; and, in order to meet any possible objection, this has been safeguarded by exceptional precautionary measures to prevent any smell. Mr. Sutton says the destruction of the saturator gases is now effectual; the spent liquor settling-tanks are covered, and the vapour therefrom condensed; the "devil liquor" is collected in sealed vessels, and is run back to the ammoniacal liquor well; and the vapours arising from the saturator surface are collected under a hood, and conveyed to the boiler fires. Consideration of the infliction of a fine under sections 7 and 20 of the Alkali Act arose early in the year. A sudden blockage occurred in the neutralizing towers connected with the sulphate plant at one works in the district; and the foreman, without the knowledge or consent of the Manager, disconnected the apparatus for the purpose of clearing the obstruction, without first turning off the liquor supply to the still. Consequently, for some time the foul gases escaped into the atmosphere, to the danger of the workmen and surrounding property; and the Inspector found the plant in this condition. Mr. Sutton characterizes this as "a grave error of judgment on the part of the foreman, who should have been aware of the gravity of his action." He was severely reprimanded, and a warning was given. Section 20 provides that where an offence is committed under the Act by an agent or workman without the knowledge or consent of the owner, the servant or workman is liable to pay the fine and the costs of the proceedings.

On the subject of tar distillation, Mr. Sutton says there was a further extension last year of plant for the preliminary dehydration of tar, or semi-distillation by heating processes before running the tar into the finishing stills for separation by distillation of the heavy oils. When this is properly carried out, the distillation period in these stills occupies only some four or five hours, and the stills can be recharged and worked at once. The plant has consequently a greatly increased capacity. Mr. Sutton reports that the demand for "prepared" tar—viz., tar from which the water and spirit have been removed by partial distillation, and thus made suitable for road dressing—is likely to find considerable extension in the immediate future. On this matter he says:

> In recent years, increasing quantities of tar have been used on the streets and highways in the preparation of roads suitable for the ever-increasing motor traffic; and, unfortunately, large quantities of tar so used have not first been submitted to such treatment as would ensure the removal of all useless and harmful ingredients. The heating of tar to the extent required to remove the water and naphtha, and thus make it both useful and safe for road dressing, necessitates it being raised to a temperature of 140° C.; and when heated to this extent, it should be done in a properly constructed still, and under skilled supervision, which would ensure the volatile products being properly condensed and dealt with. When raw tar is heated in the open and on the roadway, as is frequently the case, the volatile products evolved are likely to cause nuisance and damage. Further, the washings from roads newly treated with raw or improperly prepared tar are liable to seriously pollute watercourses and streams; and recently the Board of Agriculture and Fisheries has issued a circular to the Borough Councils of England and Wales calling attention to complaints of alleged pollution of streams, and consequent damage to fisheries, by washings from newly-tarred roads. If properly prepared tar was invariably used, there would be no necessity for the issue of this caution.

Report to the Secretary for Scotland.

Following the reports of the District Inspectors is Mr. Curphey's report to the Secretary for Scotland. The details of the work done in this portion of the United Kingdom are furnished by Mr. J. W. Young, formerly a District Inspector, who, as already mentioned, was selected

to succeed Mr. Curphey on his appointment as Chief Inspector. We extract the subjoined particulars.

The number of works in Scotland registered under the Alkali Act during the past year was 168; being a decrease of one on the number registered in 1909. Three works were added to the register, while four previously registered were closed. The processes carried on numbered 278, compared with 274 the preceding year. The quantity of salts of ammonia made (expressed as sulphate) was:—

	Tons.	Inc. on 1909. Tons.
Gas-liquor works	20,334	.. 360
Iron-works	18,815	.. 29
Shale-works	59,113	.. 2065
Producer gas, coke, and carbonizing works	18,696	.. 1751
Total	116,958	.. 4205

The number of visits of inspection was 606; and 412 separate chemical tests were made. The escape of noxious gases arising from various processes was rather less last year than in 1909. There were 104 works registered for the treatment of gas liquor and the manufacture of sulphate and muriate of ammonia; and they received 275 visits. The whole of the gas liquor was distilled by continuous methods; the sulphuretted hydrogen evolved in the course of operations being dealt with by oxide of iron purifiers in 59 works, by the Claus process in one works, partially by precipitation of metallic salts in another, and partially by combustion in four others. At the iron-works, shale-works, coke-ovens, and producer-gas works, other methods are adopted, as to which there was no change last year from previous practice. The Claus process worked smoothly, with most satisfactory results; the average acidity of the chimney attached to the process being 0·95 grain of sulphuric anhydride per cubic foot.

With the exception of four works, there was little fault to find with the oxide of iron purifiers. In these cases, however, it was necessary to urge grave remonstrance against improper conditions. Mr. Young states that in many works more attention is required, in the case of the ordinary box purifiers, to combat the tendency of foul gases to creep up the face of the inner wall. He points out that the activity of a box purifier may be greatly prolonged by renewal of the oxide round the edge, without disturbance of the remainder. He says this apparent avoidance by foul gases of the centre of purifiers partly explains the superior efficiency of small boxes over large ones, in that the perimeter is proportionately greater. For several other reasons, he thinks it is advisable to substitute a number of small boxes for a few large ones. This change has been made with most satisfactory results at one of the leading works, and is probable at another still more important. Among other causes of purifier troubles are insufficient cooling of the foul gases before entering, and "souring," which seems rather more common in Scotland than in the North of England. The blue appearance of prussiates, or the rarer red of thiocyanates, of iron is not at all infrequent. These colours demonstrate oxidation of previously formed sulphide of iron to sulphates. Oxide containing these compounds remains inert however long it is exposed in order to sweeten. Notwithstanding repeated advice by Mr. Young's predecessor as to the need for the addition of lime or some other alkaline material in such a case, its use is still exceptional. The "heap" system, in place of box purifiers, has not as yet made much progress in Scotland. It is employed at present at eight works, in most of which it has been newly introduced; but Mr. Young has been informed that there have been instances of reversion to the box system. At two works the heaps were very unsatisfactory; but, owing to lax management, it is doubtful whether any other system would have resulted better. Their advantages are generally appreciated by those who have used them. Their virtues, however, may become a vice, in that too much is expected of them. Mr. Young relates the following experience:

> Recently I had complaint from an experienced manager to whom I had recommended a trial. I found, on inquiry, his trouble was that back-pressure had proved too heavy on the still, after the heap had absorbed the foul gases from as much gas liquor as would have obliged a box purifier containing the same bulk of oxide to have been renewed twice at least; that the trial had been made at a time of year when working was most nearly continuous; that the oxide itself was blue, sour, and consequently partly inert; and, lastly, that the distributing area within the heap for the foul gases was too small. I take blame to myself on this latter point. Experience has led me to modify my earlier views. The area of distribution should be ample, though less than in a box purifier; and the contour of the heap should be flattened rather than conical.

With regard to the degree of purity and appearance of the sulphate of ammonia obtained from the saturators charged with common acid from pyrites, Mr. Young says it is generally better in Scotland than he has observed elsewhere. This is probably owing to more careful working. At one place he noticed that the salt was particularly good; and he found that the tar, which is customarily employed in skimming operations, was always inserted through the acid charge-hole in the rear of the apron. This seemed to render the separation of arsenic sulphide more nearly complete than when the tar is added in the usual way in front of the apron. A marked improvement was noticed when this simple change was tried at other works.

Mr. Young says it is always pleasant to hear of the utilization of "rubbish;" and he mentions that for some years the Dalmellington Iron Company have been supplying the village near their works with illuminating gas. In place of coal, a waste material removed from the blast-furnace flues is charged into the gas-retorts; and a coke containing 60 per cent. of carbon and a valuable proportion of iron remains after gasification. This is returned to the blast-furnaces. Thus, instead of rubbish, costing money for removal, the Company obtain coke and iron gratis, and the villagers a 50 per cent. reduction in their gas bills.

There were 41 works registered last year for the distillation of tar, though in a few of the smaller gas-works this is partial, and entails only the removal of the naphtha. In the other works, the tar is separated into pitch, and more or less completely into the various liquid constituents. The uncondensed gases are in most cases treated in purifiers filled with lime, or lime mixed with oxide of iron; but at the iron-works these gases are returned to the general circulatory system. At one works, where the stills are gas-fired and vertical in shape, the manhole is in the centre of the base of the still instead of being above as usual. From the point of view of safety and comfort to the men cleaning a still and easiness of ventilation, Mr. Young says it seems most desirable that this pattern should be more generally adopted. He knows of fatal accidents in works, and several narrow escapes from death, which would have been impossible in stills of this type.

In the course of his comments upon Mr. Young's report, the Chief Inspector refers to the increased production of sulphate of ammonia in Scotland, as shown by the figures already given. He says the increase from gas-works may be regarded as a measure of the growth in gas manufacture. The small increase from iron-works cannot, however, be taken as an indication of the comparative activity in blast-furnaces, as the production of Scottish pig iron last year was 1,414,000 tons, compared with 1,361,000 tons in 1909. A larger number of blast-furnaces were kept in operation; and the comparatively small increase of ammonia recovered in iron-works may be attributable to a greater use of coke in the furnaces. The increase from shale-works indicates an active year; and the increase from producer gas, coke-works, &c., is associated with the starting of two new recovery plants during the year. The "direct" system of the recovery of ammonia from coke-oven gases, already mentioned in his report to the Local Government Board, was put into operation in Scotland with successful results during the year.

In continuation of the table presented in recent annual reports of the progress of shale distillation and ammonia recovery, Mr. Curphey gives the figures, compiled from the statistical returns to the Home Office on Mines and Quarries, for the ten years ended Dec. 31 last. They show that the total quantity of shale mined in the United Kingdom in 1901 was 2,350,277 tons; the amount of sulphate of ammonia recovered being 40,011 tons, or 38·2 lbs. per ton of shale. In 1906, the figures were 2,545,724 tons, 48,534 tons, and 42·7 lbs.; while last year they were 3,130,280 tons, 59,113 tons, and 42·3 lbs. Mr. Curphey says it is of interest to note that a condition of approximate uniformity has been maintained of recent years in the proportion of ammonia yielded per ton of shale mined and quarried.

EDINBURGH AND LEITH GAS COMMISSIONERS.

The Accounts for the Past Year.

The annual accounts of the Edinburgh and Leith Gas Commissioners, dealing with the year ending May 15, which have been issued subject to audit, and with reference to which a short statement was given in last Tuesday's "JOURNAL" (p. 999), show the following results.

The original capital account amounted to £993,000, upon which there was payable annuities to the amount of £35,200. The capital has been reduced by £98,433, by the redemption of £3510 of annuities; leaving the capital at £894,566, and the annuities at £31,690. Loan capital authorized amounts to £1,400,000. By their Act of 1908, the Commissioners are empowered to borrow, in addition, any sum up to £800,000, for the purpose of redeeming annuities, compulsory or otherwise. This power does not appear to have been yet exercised; but the Commissioners have, for general purposes, borrowed £1,099,195. Mortgages have been repaid to the amount of £109,873. There has been added to reserve fund £25,000. The borrowing powers have been further reduced by £250 which has been realized for property sold. The borrowing powers which remain amount to £165,682.

The capital expenditure of the Commissioners is stated at £2,244,528, made up of £1,068,934 as the cost of acquiring the undertakings of the Edinburgh, the Edinburgh and Leith, the Portobello, and the Corstorphine Gas Companies, which sum is reduced by £15,361 received for plant and properties sold and value of plant transferred to the Granton works; leaving the cost of acquisition at £1,053,573. Capital outlays since the dates of acquisition have amounted to £886,979 (which includes £841,537 upon the Granton works) upon works; £193,677 upon main and service pipes, and cost of laying; £65,046 upon gas-meters; £10,170 upon properties not embraced in the works; £13,048 upon gas cooking and heating stoves; £22,671 upon parliamentary expenditure; and £363 upon office furniture. The only capital outlay during the year was £517—upon main and service pipes. There was transferred, in December last, to old works, &c., suspense account a sum of £435,000, which was subject to a deduction of £25,000 in respect of mortgages repaid out of the special reserve fund; leaving the amount in the suspense account at £410,000.

In the revenue account, the total income is stated to have been £338,052—a decrease upon the previous year of £14,902. The decrease is explained by a falling-off in the quantity of gas sold, equal to 2·39 per cent., and the reduction of 2d. per 1000 cubic feet made in November last to ordinary and prepayment meter consumers. Gas sold amounted to 1,895,265,700 cubic feet—a decrease of 46,413,700 cubic feet. The revenue from gas, less £3754 of discounts and allowances, amounted to £252,631—a decrease of £22,311. Ordinary consumers used 1,611,609,000 cubic feet of gas; and prepayment consumers, 70,628,000 feet. The other consumptions were: Gas-engines, 27,583,300 cubic feet; gas for engines and trade purposes other than lighting, 32,576,300 feet; stair-lights, 67,811,900 feet; public lamps, 82,560,000 feet; and gas supplied in bulk, 2,397,400 feet. The other revenues were: Coke, less £6616 working expenses and railway carriage, £30,980—a decrease of £1191; tar, £12,405—an increase of £925; sulphate of ammonia and ammoniacal liquor, less £5035 working expenses, £23,859—an increase of £2716. The rental of stoves, meters, &c., amounted to £2821—an increase of £45; prepayment meters, &c., £4360—a decrease of £327; and meters for special purposes, £261—an increase of £327. Stair-lighting (a new scheme) cost, for maintenance and labour, £5992. The sale and fitting of gas appliances realized £3676—an increase of £87. The cost of coal was £95,037—an increase of £1433; of gas oil, £1273—a decrease of £1637; of carbonizing wages, £11,781—a decrease of £852; of salaries and wages at works, £12,901—the same as in the previous year; of purifying materials and the wages of purifier men, £789—a decrease of £72; and of repairs and maintenance of works and

plant, &c., £24,311—a decrease of £7567. The total cost of gas manufacture was £146,098—a decrease of £8395. Distribution of gas cost £27,748—a decrease of £487. Gas stoves and appliances cost £7624—a decrease of £1113. Management cost £11,394—a decrease of £77. Rents and feu-duties amounted to £627—an increase of £3. Rates and taxes came to £22,923—an increase of £5535. Allowances during the pleasure of the Commissioners amounted to £1008—a decrease of £225. The Commissioners' contribution to the superannuation fund equivalent to the contributions by the employees, amounted to £1669—a decrease of £141; and there was a special contribution by the Commissioners to the superannuation fund of £2035—the same as in the previous year. The total cost of superannuation was £4713—a decrease of £367. Compensation cost £108—a decrease of £79; law and parliamentary expenses, £121—a decrease of £84; and bad debts, £822—an increase of £39. The total expenditure was £222,177, which was £5416 less than in the previous year. The balance to profit and loss account was £115,874—a decrease of £9486.

From the balance of £115,874, there is payable: Annuities, £31,888; and interest on money borrowed, £39,659. There was transferred: To sinking fund in respect of annuities redeemed, £3311; in respect of interest on mortgages repaid, £2535; for redemption of annuities, £6709; for repayment of money borrowed, £10,992; to general reserve fund, £1085; and to special reserve fund, £13,548. These sums, with £398 expenses of mortgages, amount to £110,126, and leave £5748 at the credit of profit and loss, compared with £13,564 a year ago.

The sinking fund for the repayment of money borrowed amounted twelve months ago to £144,684. There was transferred to it from the profit and loss account £10,992; in respect of mortgages repaid out of the sinking fund, £2534; and interest was received for the year amounting to £2306. The sinking fund for the redemption of annuities amounted a year ago to £256,745. There was added to it during the year, from the profit and loss account, £6709; transferred in respect of annuities redeemed out of the sinking fund, £3311; and received as interest, £5951. The total of the sinking funds was thus brought up to £432,233. Twelve months ago there had been paid in the redemption of mortgages £79,873. During the year, there was expended upon this head £30,000, raising the expenditure to date upon the redemption of annuities to £109,873. A year ago, there was expended in redeeming annuities £80,437; and there was expended on this head in the year £19,871—making the total cost to date of redeeming annuities £100,308. The sum left in the sinking funds, after these payments, is £223,052.

The superannuation fund account began the year with £4718. There was contributed to it by employees £1669, and by the Commissioners a similar amount; and interest received raised it to £10,294. The expenditure from the fund consisted of: Allowances to employees, £3024; and contributions repaid to employees on leaving the service, £127. There is left in the fund, £7143.

In a statement of gas made, sold, &c., which is issued with the accounts for the first time, and which has been prepared to meet the requirements of the Scotch Office, it is stated that the coal carbonized and oil equivalent amounted to 190,997 tons; gas made to 2,044,182,000 cubic feet; gas sent out, to 2,043,292,000 feet; gas sold, to 1,895,265,700 feet; gas used at works, offices, &c., to 20,243,200 feet; and the gas unaccounted for, to 127,783,100 feet. The gas made per ton of coal and oil equivalent amounted to 10,703 cubic feet; gas sold per ton of coal and oil equivalent, to 9923 feet; gas sold per cent. on gas sent out, 92·76; gas used at works, offices, &c., per cent. on gas sent out, 0·99; and gas unaccounted for per cent. on gas sent out, 6·25. The average cost per ton of coal and oil equivalent was 10s. 1·02d.; the cost of coal and oil per 1000 cubic feet of gas made was 11·31d.; and the net revenue from residual products per ton of coal and oil equivalent was 7s. 0·50d. The consumers of gas within the municipal boundaries of Edinburgh and Leith numbered: Credit, 81,760; and prepayment, 11,420. Outwith the municipal boundaries: Credit, 2390; prepayment, none. The total number of consumers was 95,570. The average price of gas per 1000 cubic feet, after deduction of discounts, &c., was 2s. 7·99d. The prescribed illuminating power of the gas was 14 candles; and supplied, 17·07 candles. There are 436½ miles of mains; 11,938 public lamps, and 17,579 stair lights; and there are 8957 gas-cookers on hire.

The accounts were submitted to the Commissioners at a meeting on Monday the 26th ult.; and, on the motion of Judge Inches, they were remitted to the Committee for consideration and report.

STOURBRIDGE GAS UNDERTAKING.

Annual Report and Accounts.

The Gas Engineer and Manager of the Stourbridge Urban District Council (Mr. Charles H. Webb, M.Sc.) has presented his report for the year ended the 31st of March. It shows that the sales of gas increased by 5,923,900 cubic feet; being 3,160,800 cubic feet on ordinary, and 2,763,100 cubic feet on prepayment meters. The money value of this increase is £749 12s. 2d. The residuals market was good throughout the year; and this, with the increased sales of gas, brought the gross profit on the year's trading to £11,977. After deducting income-tax, instalments of sinking fund, interest, &c., there was a surplus of £3005—an increase of £496. The working statement shows that 227,770,000 cubic feet of gas were made; and that 204,505,100 cubic feet were sold for private and public lighting, or 89·79 per cent. of the make, which was at the rate of 11,025 cubic feet per ton of coal carbonized. The coke and breeze made per ton of coal was 12¾ cwt.; tar, 11·44 gallons; and the sulphate made per 100 tons of coal was 16¾ cwt. The accounts (certified by Messrs. Wood, Drew, and Co.) show that the sale of gas produced £26,983; meter and stove rentals, £1272; and residuals, £10,077—making a total of £38,332. The expenditure being £26,355, the amount carried to the profit and loss account was, as stated above, £11,977. This was at the rate of 11s. 7·14d. per ton of coal carbonized and 14·05d. per 1000 cubic feet of gas sold; the surplus (£3005) being at the rate of 2s. 10·91d. per ton of coal and 3·52d. per 1000 cubic feet of gas sold.

BRADFORD CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer and Manager.

The Gas Engineer and Manager of the Bradford Corporation (Mr. Charles Wood) has presented to the Gas Committee his report on the working of the gas undertaking in the twelve months ended the 31st of March. It is accompanied by an analysis of the gas accounts, compared with those for the preceding year.

Mr. Wood opens his report with the gratifying statement that there is reason for everyone connected with the Gas Department to be proud of the past year's results; the trading showing a net improvement over the previous year of the satisfactory sum of £13,672. The net profit was £12,934, which is more than double that made in any previous year since the price of gas was reduced to the present figure seven years ago. These results have been obtained, Mr. Wood points out, notwithstanding the increased amount paid for wages, rates and taxes, and nearly every class of material used, and, above all, in spite of the still heavy burden caused by the purchase of the several gas undertakings since 1900. The payment of interest and sinking fund charges on the goodwill alone of these undertakings cost £18,800 last year. In addition, the benefit to the gas consumers in the added districts amounted to no less than £13,166. All the repairs and renewals, new services, and the alterations at the Thornton Road works were charged entirely to revenue. In comparing the returns with those of others, Mr. Wood says it is important that these facts should not be overlooked. The coal contracts last year were, he believes, absolutely the most favourable made anywhere. The working results—taking into consideration the fact that the Committee have been using up the old carbonizing plant at the Thornton Road and other works—have easily been a record. The only feature that is not entirely satisfactory is the small rate of increase in the quantity of gas sold in the central area of the city. This is explained to be due to the extended employment of electricity, and to the more economical methods of using gas; and Mr. Wood says it only proves the necessity of utilizing every reasonable opportunity of advertising the many advantages of gas and extending its use.

The total quantity of gas produced during the year was 2,138,002,000 cubic feet; being an increase of 66,823,000 cubic feet, or 3·22 per cent., compared with the previous year. The gas sold, including 160,335,000 cubic feet used in the public lamps, amounted to 2,004,042,000 cubic feet, or an increase of 3·03 per cent., of which about 19 million cubic feet, or 0·95 per cent., was used in the recently acquired Ripleyville district. Mr. Wood gives a table showing the quantities of gas sold in different districts during the year ended Dec. 31 last, and for the preceding year. For purposes of comparison, the figures for 1899 are also given; this period being prior to the taking over of the North Bierley, Clayton, Eccleshill, Idle, and Heaton districts. The table shows that there was an improvement in every district.

During the year ended March 31 last, 204,765 tons of coal and cannel were carbonized; 5·31 per cent. of cannel being used, against 5·52 per cent. in 1909-10. The average cost of the coal was 10s. 7·52d. per ton; the previous figure being 10s. 9·25d. The quantity of coal carbonized per retort was 306 lbs.; being 1 lb. less than for the previous twelve months. The average quantity of gas made per ton of coal was 10,441 cubic feet; being 19 cubic feet less than in 1909-10, due to the working at Ludlam Street.

Dealing with the revenue account for the year, Mr. Wood remarks that the total salaries for manufacture, distribution, and management amounted to £5715, an increase of £205; and carbonizing wages to £28,905, an increase of £981. Coal cost £108,806, or £2168 more; and the expenditure on purification was £4211, or £53 more. The sum of £27,385 was spent on the repair and maintenance of works; being an increase of £724. The repairs to mains and services, including the cost of new services, amounted to £5023—being a decrease of £465. A sum of £669 was spent on repairs of meters, or £149 less than before. Meter inspection cost £3605, or a decrease of £53. The Finance Committee's charges for administration and collection of accounts were £1700—the same as for several years past. Miscellaneous expenses amounted to £847, or a decrease of £257. Stationery cost £506, or £24 more; and bad debts, which amounted to £1357, were higher by £25. The amount paid for rents (principally ground rents) was £32 more than before. A sum of £14,703 had to be paid for rates—an advance of £445. The stove department cost £3781; but the revenue therefrom was £3904—leaving a balance of profit of £123, against £583 in the previous year, when the sales of stoves were abnormally great. During the year, a good deal more was spent in advertising the uses of gas, of which Mr. Wood says the Committee will certainly reap the benefit by increased business.

The following are the main items of income: £192,872 was received for gas—an increase of £4789; meter-rents amounted to £2640, or £60 more; coke yielded £39,262, or £6567 more; tar brought in £13,571, or an increase of £2405; and ammoniacal liquor produced £20,454, an increase of 3628; while from the sale of spent oxide a sum of £2996 was received, or an increase of £496. The cost of coal, less residuals (excluding the profit on the chemical works), was £35,518; being £10,432 better than in the year 1909-10. Purification, less the revenue from spent oxide, cost £1214, or £443 less. The rents received amounted to £1086, or £82 more. The gross profit on the chemical works, including the profit on the sale of ammoniacal liquor, was £3621, against £3365 in the preceding year. The gross profit was £72,496, or £14,091 more than before. Interest on loans, &c., amounted to £29,493, which is a decrease of only £142. Income-tax was £212 more; while the contribution of £26,866 to the sinking fund shows an increase of £250, due to the purchase of Messrs. Ripley's undertaking. The net profit is thus £12,934, or £13,672 better than for the year 1909-10.

During the past year, the sum of £1803 was spent on capital account entirely upon gas-mains, and £1046 at the chemical works. These sums, with the purchase price of Messrs. Ripley's gas undertaking (£15,151), bring up the total expenditure on capital account to £1,183,631.

A sum of £27,500 was received last year towards the cost of street

lighting. The amount paid for gas used for this purpose worked out at 1s. 3½d. per 1000 cubic feet.

The principal items of the working results are given in the tables appended to the report; and almost every item shows an improvement. The average cost of gas in the holders has fallen from 11·601d. to 10·185d. per 1000 cubic feet. The average illuminating power of the gas supplied during the year was 17·05 candles, as officially tested; but Mr. Wood says it must be remembered, when comparing the results with others, that the Act of Parliament requires in Bradford a certain old type of burner to be used. When tested by the "Metropolitan" No. 2 argand burner, Bradford gas has an increased value of from 3¾ to 4 candles.

The following are some of the items from the working statement for the past year; the figures for 1909-10 being given for comparison:—

	1909-10.		1910-11.
Coal and cannel carbonized, tons . . .	198,009	..	204,765
Gas made, thousands of cubic feet . . .	2,071,179	..	2,138,002
,, per ton of coal, cubic feet . .	10,460	..	10,441
,, per retort charged, cubic feet .	1,436	..	1,430
Retorts charged	1,442,121	..	1,494,682
Gas accounted for, thousands of cubic feet.	1,944,971	..	2,004,042
,, ,, per ton of coal, cubic feet	9,823	..	9,787
,, ,, per cent. on make . .	93·91	..	93·74
Coke and breeze saleable, tons	86,883	..	89,474
,, ,, per ton of coal, cwt. . .	8·77	..	8·73
Tar made, tons	12,171	..	12,509
,, per ton of coal, gallons . . .	11·98	..	11·91
Liquor made, tons	27,413	..	27,412
,, ,, per ton of coal, gallons . .	30·24	..	29·25

The analysis of the accounts shows that the net cost of gas was £120,375, or at the rate of 14·416d. per 1000 cubic feet of gas sold, compared with £129,678, or 16·002d. per 1000 cubic feet sold, in 1909-10. The net profit last year was, as shown above, £12,934, compared with a net loss of £737 before; the rates per 1000 cubic feet of gas sold being respectively 1·549d. and 0·091d.

OSSETT CORPORATION GAS UNDERTAKING.

Successful Working.

At the last meeting of the Ossett Town Council, the report of the Gas Engineer and Manager (Mr. A. E. Mottram) for the year ended March 31 was submitted. It showed that the make of gas was 121,950,000 cubic feet, of which 114,983,300 cubic feet had been sold; being an increased make of 5,691,000 cubic feet and sale of 5,471,900 cubic feet, compared with the previous year. The quantity of coal carbonized was 10,927 tons, and the yield of gas 11,160 cubic feet per ton, compared with 10,590 tons and 10,978 cubic feet per ton before. The gross profit was £8265. As the interest and sinking-fund charges came to £6483, there was a balance of £1782. Attached to the report was an analysis showing the cost of gas per 1000 cubic feet sold last year compared with 1909-10. The gross cost was 2s. 3·71d., against 2s. 4·68d.; and the net cost exclusive of capital charges, 1s. 5·68d., compared with 1s. 6·99d. Interest and sinking-fund charges added made the total cost of production 2s. 7·21d., against 2s. 9·21d. The receipts for gas, meter-rents, &c., were 2s. 10·94d., against 2s. 10·86d. before; and the instalment proposed to be added to the reserve fund was 3·71d., against 0·72d.

In submitting the Gas Committee's minutes for adoption, Mr. H. Robinson, the Chairman, paid a high tribute to the able, devoted, and exemplary industry of the management, and said that in every department officials and workmen alike had shown a deep and intelligent interest and enthusiasm in the work. The Committee had spent close upon £500 within the works. In early years, after the rebuilding of the retort-house, it was rightly thought that the outside had the first claim. The saving in the leakage had shown this to be a very wise policy. Now they had been able to turn their attention to the inside; and the works were in a sound and satisfactory condition. During the year, they had been visited by the Manchester Junior Gas Association, who unhesitatingly and unanimously expressed their delight, and some of them their envy, at what they saw. Special attention had been paid to the cleaning and regulation of burners in houses and workshops; and this had involved heavy charges. High-pressure gas had been adopted in the Market Place; and it had not only given them the best lighted market-place in the district, but had induced quite a number of business men to light up their premises on this system. In addition, the Corporation had now decided to light the large hall and Council Chamber with it. Turning to financial matters, Mr. Robinson said the capital was becoming pleasantly less. In their first year, it was £1 12s. 5d. per 1000 cubic feet of gas sold; last year it was £1 0s. 5d. At the outset, it was £14 3s. 11d. per ton of coal carbonized; now it was £10 7s. 5d. Another pleasing feature was that the reserve fund, which they started with £329, would be augmented by the profit balance of £1782; making £2110, or nearly half the amount they had power to accumulate. There had been a record in every direction—in make, in sale, in the number of customers, in the low percentage of leakage, and in profit; and each proved in its own way the soundness and capacity of the plant, the excellence of the management, and the utility and appreciation of the gas they made. Having given at some length particulars to bear out this statement, he said that since the Corporation took over the works they had increased the make by 40 million cubic feet, extended the mains 16 or 17 miles, and had doubled the capacity of the works; and in ten years they had practically paid for it all. This was a record of which they had no need to be ashamed.

The Metropolitan Water Board's Rate.—A statement has been issued by the Metropolitan Water Board to show the result of the collection on account of domestic charges and fixed supplies for the half year last ended. It appears therefrom that of the total sum of £1,163,358 to be collected, £1,047,298, or 90·02 per cent., was actually received; £83,435, or 7·17 per cent., was written off; and £32,625, or 2·81 per cent., was carried forward as recoverable arrears.

EXPLOSION AT A SHEFFIELD GAS-WORKS.

On Monday evening of last week, a severe explosion took place at the Effingham Street Works of the Sheffield United Gaslight Company, resulting in the wreck of a 4 million capacity Livesey washer, and damage to the mains and connections thereto.

It is usual at this time to thoroughly clean out all the thick tar which accumulates during the year; and for this purpose the various manholes were taken off. At the time of the explosion, the repairs had been completed, and the washer boxed up, with the exception of two set pin-holes in the top of the washer, which were left open to allow the air to blow off while the washer was being filled with liquor. The man in charge of the operation was standing by the side of the washer holding a safety lamp in his hand, about 3 feet below the level of the escaping air, when a violent explosion took place, completely demolishing the washer and breaking a 24-inch main, which, in falling, dragged the outlet-valve off the supply-main. The gas that was being made—as well as what would come back from the holder—became ignited, and made a big blaze. Steps were at once taken to stop the make and shut off the scrubbers, by which means the flames were soon subdued, with the additional help of the fire hose. Unfortunately, one of the workmen, a man named Foster, was so severely burnt and injured by the explosion that he died in the Infirmary on Wednesday.

At the inquest which was held, Mr. J. W. Morrison, the Engineer to the Company, stated he was under the impression that the explosion was caused through spontaneous combustion of greasy or tarry waste that had been left in the washer, as he had proved by experiment that the safety lamp which the man in charge of the work was using was in perfect condition; and from the evidence of the men working in the vicinity, there did not appear to have been any sparking, or matches used for any purpose whatever. The air in the washer had become explosive through gas given off from the ammoniacal liquor, the tar on the perforated plates, or gas leaking from the inlet or outlet valves. Without retiring, the Jury returned a verdict of "Accidental death."

PLYMOUTH GAS-WORKERS AND CO-PARTNERSHIP.

Last week the employees of the Plymouth and Stonehouse Gas Company had their annual outing. This was the eleventh event of the kind, and will probably be the last; the Directors having intimated that, in view of the establishment of a co-partnership scheme, these excursions will not be continued. As usual, the employees were divided into three parties, each of which carried out the same programme. The first section went on Tuesday; the party, which numbered 215, travelling by train to Dartmouth. Sir Joseph Bellamy, the Chairman of the Company, was absent through indisposition; and Mr. John Bayly represented the Board of Directors. Mr. P. S. Hoyte (Engineer and Manager), who had charge of the arrangements, and Mr. H. B. Heath (Secretary) also accompanied the party.

After luncheon, Mr. J. Walters proposed the toast of "The Chairman and the Company." Referring to the introduction of the co-partnership scheme, he said a pleasing feature of it was that the men would in future have a nice little banking account. He thought it a grand thing for the men; and personally he thanked the Directors for introducing the scheme. Mr. W. French, of the slot-fitting department, said that, though they were to lose these pleasant outings, they would gain something more valuable. The men could not but appreciate what the Directors were now doing for them. Mr. J. Ford, on behalf of the fitters, also expressed satisfaction with the introduction of the scheme. Mr. Bayly, in reply, said the Directors had watched with interest the development of the co-partnership movement in other companies, and had resolved to adopt the system when they saw that it could be worked satisfactorily. It was exceedingly gratifying to the Board to learn that, at a general meeting, the men had passed a resolution in favour of the scheme. There was a provision under which part of the money credited to the men could be withdrawn. They hoped, however, that this would not be taken great advantage of, but that the men, for their own sakes, would let it accumulate. Mr. Hoyte remarked that the co-partnership scheme would cost the Company a large sum; but much was expected from it. In order that the men might understand it in all its details, the scheme was being formally drawn up; and after it was prepared, a meeting would be held at which it could be discussed. If the offer was accepted in the spirit in which it was made, the result would be to encourage habits of thrift, as well as to make the men partners in the undertaking. Though the outings would be discontinued, there would still be an opportunity for the employees to meet once a year at a gathering in Plymouth.

During the luncheon, a telegram was sent to Sir Joseph Bellamy expressing regret at his absence, and wishing him a speedy recovery. In the afternoon the party went to Torquay, and there had tea, returning to Plymouth by train. The similar parties on Wednesday and Thursday were equally successful.

LYTTELTON (N.Z.) GAS AND WATER SUPPLY.

According to the annual report of Mr. L. A. Stringer, the Town Clerk of Lyttelton (N.Z.), the revenue of the gas undertaking for the year ended the 31st of March was £4389, and the expenditure £3517; showing a profit of £871, which was brought up to £966 by the addition of £95 profit on fittings. The quantity of coal carbonized was 1002 tons; and the gas accounted for, 11,470,100 cubic feet, of which 11,014,900 cubic feet were sold. The make of gas per ton of coal was 11,447 cubic feet. This figure was based upon the quantity of gas accounted for; the total make not being available owing to the dismantling of the old station meter and the late arrival of the new one. The salient features in the operations of the Gas Department (the Manager of which is Mr. William M'Auliffe) were the installation of a

new gas-engine and exhauster and the new station meter just referred to, the cost of which, amounting to £210, was met out of the year's revenue. Coal cost 1s. 7d. per ton more for handling than in previous years; and this, with an additional 18 tons carbonized, accounted for £98. A sum of £200 was transferred out of revenue to the sinking fund. There was a reduction in the charge for gas for all purposes to 5s. 10d. net per 1000 cubic feet, which, it was stated, brought the price below that of any other works of equal size in the Dominion.

With regard to water supply, in the five years ended March 31, 1910, there was a steady increase in the demand; and the year under review was no exception to the rule. The total consumption was 60,248,080 gallons, or at the rate of 41·26 gallons per day per head of the population, compared with 39·15 gallons in the preceding year. In 1882, the requirements of the borough amounted to 44,000 gallons per day; whereas in the past financial year 194,000 gallons were needed to meet the daily demand. Producer-gas plant has been introduced in connection with the pumping plant; and a statement in the report shows its value in comparison with steam plant. In 1908-9 (the last complete year with this plant), there was 59¾ million gallons of water pumped, at a cost of £381 for fuel; being at the rate of £6 7s. 6d. per million. Last year, which was the first complete one with the producer plant, 70½ million gallons were pumped, at a cost of £205 for fuel; being at the rate of £2 18s. per million. In other words, if the steam plant had been continued in use, the 70½ million gallons of water pumped last year would have cost £450 for fuel, against an actual cost of £205; showing a saving of £245.

PINE-WOOD GAS

At 50s. per 1000 Cubic Feet.

The monthly publication of the New York Consolidated Gas Company (entitled "Gas Logic") published in its June issue a communication entitled "Mountain Gas Making," the author of which, Mr. Geo. E. Stonebridge, wrote: When the writer was a boy he saw the first gas-pipes laid in The Bronx, and his parents subscribed for the service before the pipes were laid. The price at that time was $4 per 1000 cubic feet; and it was consumed for light only. When the price at last dropped to $1 per 1000, we felt satisfied that the bottom was touched, with the existing mode of manufacture. But while the price was still $4 per 1000, we moved to Nevada City, Cal. This little city among the gold mines was the county seat, with a population of 4000. There were 21 street lamps; the lamp-posts being tapered wooden poles, with a hole through the centre of each for the pipe. The price of gas was $12 per 1000 cubic feet. But the material from which the gas was made was decidedly interesting. Instead of coal or oil, the gas was manufactured entirely from fat pine roots; and there was a standing price for them of $12 per cord, which was twice that of oak and three times that of ordinary pine. The holder in which the gas was stored was so small that it could not be seen unless it was full, as a high board fence concealed it from view. All the streets of the town ascended a hill, radiating from a central point like the hub of a wheel. Near this hub the gas plant was located; and it required little pressure to send the gas up the surrounding hills. The yellow pine in this region was a stately tree. It grew to a height of 200 feet, and sometimes to a thickness of 7 feet. When the woodcutters found a particularly "fat" spot in a tree, they laid the piece aside, to be sold to the Gas Company, while the rest of the tree went into ordinary cord wood. All summer the teams hauled the wood into town and stacked it in large piles. It was almost impossible to do any hauling in the winter, for the mud on the mountain roads was so deep that they were almost impassable. So the Gas Company stored a supply of fat pine for the making of gas during the winter months—thus guarding against a shortage of raw material. If for any unforeseen reason a shortage really should have happened, it would have cost the Company a pretty penny; for the cost of hauling would have been so high, owing to winter conditions, that the gas would have had to have been manufactured and supplied to consumers at a great loss.

SHEFFIELD CORPORATION WATER DEPARTMENT.

Annual Report of the General Manager.

The General Manager of the Water Department of the Sheffield Corporation (Mr. W. Terrey) lately presented to the Water Committee his report for the year ending the 25th of March. It shows that the total capital expenditure on the undertaking up to that date had been £3,571,182, compared with £3,517,186 at the corresponding period last year. The total income from all sources for the year was £178,111, or £7219 higher than that for 1909-10; and the expenses of maintenance and management amounted to £41,590. The net revenue was thus £136,520, or £6568 more than before. Deducting annuities and interest, £112,657, the net profit was £23,863—an increase of £5363. The sinking fund requires £12,419; so that the year's surplus is £11,444—an increase of £5417 compared with 1909-10. The value of the water supplied to the Health Committee without charge, for street watering, public baths, &c., was £3932. The special account relating to the sinking fund shows that the total sum provided out of revenue and appropriated for the repayment of debt to the 25th of March last, with earnings thereon, amounts to £283,820; and the available surplus on that date was £83,065.

The length of new mains laid during the year was 10 miles 719 yards; bringing up the total length (including Handsworth, re-incorporated on Sept. 29 last) to 572 miles. The average estimated population supplied within the statutory district, which covers an area of 134 square miles, was 518,906—an increase of 2·75 per cent. The Corporation also supply water in bulk to Rotherham, Doncaster, the Rotherham

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rural district, Chapeltown, and other outside areas, representing an additional population of 164,885; and making a total population of 683,791 supplied from the works of the Corporation. The number of houses served was 112,436, or an increase of 4490. The additional number of water-closets supplied was 4279, making a total of 60,239; and of baths, 17,944—an increase of 1211. There are 4218 meters in use, against 4139 before. The total number of domestic and trade supplies on the 25th of March was 213,208; being an increase of 10,891 new supplies laid on during the year.

The total volume of water sent from the works of the Corporation during the year, including the statutory compensation water to the Rivers Rivelin, Loxley, and Little Don, was 10,434,135,519 gallons. It was disposed of as follows: Trade purposes, by meter, 1,906,818,033 gallons; supplies in bulk to local authorities by meter, and statutory supplies to Rotherham and Doncaster, 1,183,004,500 gallons; domestic purposes, including water supplied for extinguishing fires and waste, 2,433,695,090 gallons—making the total town supply 5,523,517,623 gallons. Adding the compensation water, 4,910,617,896 gallons, makes up the above-named total of 10,434,135,519 gallons, compared with 10,248,467,812 gallons in 1909-10. The average daily supply during the past financial year was 28,586,672 gallons, against 28,077,994 gallons in the preceding twelve months.

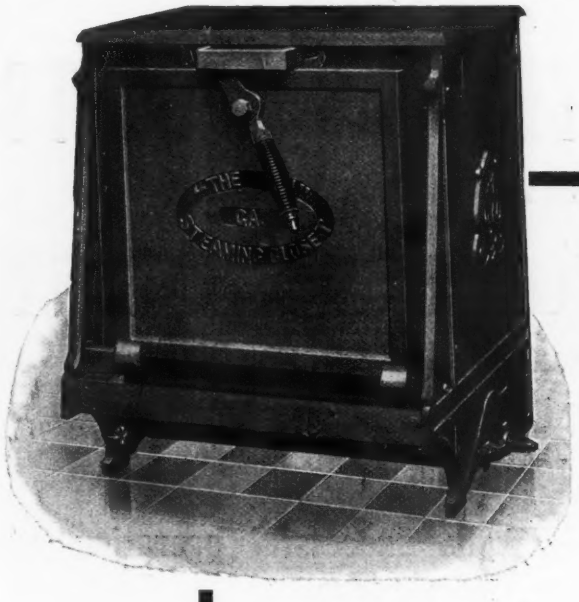
NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual accounts of the Edinburgh and Leith Gas Commission, of which an abstract is given in another column, disclose a business which has been successfully prosecuted, and continues to be so. After much negotiation with the Scotch Office, who in these matters are authoritative, the form in which the accounts are henceforth to be presented has been fixed. While not disputing that there may be improvement in the alterations, this improvement can lie only in the direction of making the form of accounts assimilate to the accounts of other undertakings. The changes have been dictated by a desire for uniformity in gas accounts which is altogether good; but they have not been necessitated, nor will they have the effect of rendering the financial position of the undertaking in any degree more stable, so far as the community is concerned, nor the preparation of the accounts an easier task upon the Treasurer's department of the Gas Commission. Probably in the Scotch Office the official who is charged with the duty of tabulating the financial and other results of the gas undertakings of the country will find it easier to understand the accounts when they are all framed upon the same lines, and lines, too, which they themselves have laid down. This is about all that can be said for the requirements of the Scotch Office. One effect of the changes is to render comparisons with the form of accounts hitherto in use next to impossible to make; and so we have to go back for some years in order to realize fully how great has been the increase in the business of the Commission. Looked at in this way, we find that the output of gas has increased, in the course of the last nine years, by 130,553,000 cubic feet, and that the price has been reduced from 3s. 4d. to 2s. 8d. per 1000 cubic feet. In the same time, the gross revenue has increased from £329,052 to £347,502—an increase of £18,450. The number of consumers has augmented by 11,510; and the number of cookers on hire by 2514. There are 8957 gas-cookers on hire. This figure is not to be confounded with the number in use, because there are many gas-cookers which are not on hire, but are possessed outright by the users. Still the numbers on hire at different dates give an indication of the extent to which the use of gas for cooking is being adopted; and it is evident that an increas eof 2500 in nine years does not indicate that the field which is available will be fully occupied at a very early date. The Commissioners seem to have some notion of this sort, as on Monday they remitted to a Committee to consider as to the holding of an exhibition of gas appliances in the autumn. A few words of a complimentary nature with regard to the form of presenting the accounts may not be amiss. When they came before the Commissioners, they were accompanied by a prepared detailed report by the Treasurer and Collector—Mr. A. Canning Williams—which, in their consideration of the figures, must be of great assistance to the Commissioners. In his report, Mr. Williams explains some of the new features; and otherwise he makes much plainer than the accounts do the trend of affairs during the year. They may be regarded as already final, because the audit cannot alter the results set forth; and the Commissioners have no reason to cavil over the accounts, nor over the results of the year's working.

The announcement is made that the estimates for the current year of the Dunfermline Corporation Gas Department were under consideration by the Gas Committee on Tuesday, and that it is understood that they showed that, as the result of economy of management, it would be possible to effect a reduction in the price of gas, but that it is unlikely that any alteration of charge will be made, because of the probability of the Gas Department being burdened with a share of the cost of the promotion of the Greater Dunfermline Bill. Commenting upon this announcement in a column of "Notes and Suggestions" published in the "Dunfermline Press" to-day, the following statement is made: "The Manager of the Corporation Gas Department and the Convener of the Gas Committee are to be congratulated on the financial working of the concern. A year ago, the price of gas was reduced by 3d. per 1000 cubic feet; bringing down the charge for ordinary consumers to 2s. 3d.—one of the lowest rates in Scotland. Mr. Stewart (the Convener) indicated that there might be a further reduction this year; and this forecast would have been realized but for the view of the financial experts of the Town Council that the Gas Department should bear part of the cost of promoting the Burgh Bill. It is, of course, immaterial to the ratepayers how the parliamentary inquiries are paid for; but those responsible for the management of the Gas Department have a grievance. They are being robbed of some credit that they would have



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been in a position to claim if Greater Dunfermline had paid for its greatness out of something else than gas."

The installation of high-pressure gas lighting which the Town Council of Dunfermline two or three months ago gave their sanction to be introduced into High Street and Bridge Street of the burgh has been completed. The work has been done to the order of Mr. Alex. Waddell, the Gas Engineer. The plant employed is that of the James Keith and Blackman Company. There are twenty lamp-standards. Of these, four, placed at the Cross and at street corners, carry lights of 1500-candle power each; and the remainder have lights of 1000-candle power each. All the lamps have been fitted with a supplementary low-pressure lamp, for use after midnight. It is regarded with satisfaction locally that in Dunfermline they have had erected the first complete and permanent system of high-pressure street lighting which has been introduced in Scotland.

Mr. J. Clark, the Convener of the Gas Committee of the Perth Town Council, has prepared a scheme in which it is proposed to introduce mechanical stoking into the gas-works, at an estimated cost of £3900. The power proposed to be used is electricity.

The Cupar Fife Town Council on Monday agreed to the introduction of an automatic system of lighting and extinguishing the public lamps. The cost of the work is estimated at £580; and it is anticipated that by it there will be an annual saving of about £90.

The work of the removal of the chimney at the now disused gas-works in Edinburgh has been entrusted to Messrs. J. Dennis and Co., Limited, of Dalkeith; and it is being proceeded with as rapidly as possible.

A new water supply for Grangemouth, and intended also to serve the central district of Stirlingshire, was formally inaugurated yesterday. The works have been under construction for nearly six years. There was considerable difficulty in the making of the embankment for the reservoir which impounds the water of the Bannock Burn, on account of volcanic ash being found in the rock at a considerable depth. The ash being porous, it was necessary to dig the trench to a depth of, in some places, 116 feet, before a solid foundation was reached. The reservoir is of a capacity of 450 million gallons. It is about a mile in length, and has a width, in some parts, of about half-a-mile. The top water-level is 583 feet above sea-level; and the depth of water is 42 feet. The gathering-ground extends to about 2500 acres. The water supply in Grangemouth will now be equal to 2,200,000 gallons per day. On account of the difficulties that were encountered in the course of the work, the original estimate of £65,000 has been more than doubled; the cost of the completed works having been almost £150,000. The Engineers for the undertaking were Messrs. Warren and Stuart, of Glasgow; and the Consulting Engineer, Mr. J. Watson, of Bradford. The water was turned on at the reservoir by Mrs. Mackay, the wife of the Provost of the burgh.

The annual conference of the Scottish Sanitary Inspectors' Association was held in Dundee yesterday. In the course of his presidential address, Mr. T. Bishop, of Leith, dealing with smoke prevention, said it was strange that users of power plants had not given more time and study to methods for preventing the terrible fuel waste now caused by defective combustion. It had been estimated by an eminent American authority that 8 per cent. of all coal used for making light, heat, and power went up the chimneys in smoke. On this extremely moderate estimate, the annual loss in Great Britain alone must amount to some millions of pounds sterling. The serious damage done to property must also be taken into account. It would pay owners and operators of steam and power plants to unite in founding and maintaining an experimental plant, where new methods of combustion could be tested.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 66.]

LONDON, *July* 3.

Tar Products.

The markets for tar products continue firm. There has been a little more inquiry for pitch during the past week, next season's delivery, and in some quarters improved prices are reported to have been paid. Benzol 90 per cent. is steady, though there is not very much business doing. Solvent naphtha is quiet; but there is a fair demand for heavy naphtha. Crude carbolic is very firm; and there is more inclination to do business for forward delivery. There has been a little more business in creosote at improved prices; and there is still inquiry for delivery to the end of this year and into the first few months of next.

The average values during the week were: Tar, 18s. to 22s., *ex* works. Pitch, London, 36s. to 37s.; east coast, 36s. to 36s. 6d.; west coast, Manchester, 35s. 6d. to 36s., Liverpool, 36s. to 36s. 6d., Clyde, 36s. to 36s. 3d. Benzol, 90 per cent., casks included, London, 9d. to 9¼d.; North, 9d.; 50-90 per cent., casks included, London, 8⅞d. to 9⅛d.; North, 8½d. to 9d. Toluol, casks included, London, 9⅜d. to 10d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 3⅞d.; solvent naphtha, casks included, London, 11d. to 11¾d.; North, 10d. to 10½d.; heavy naphtha, casks included, London, 11½d. to 1s. 0½d.; North, 10d. to 10½d. Creosote, in bulk, London, 2¼d. to 2⅝d.; North, 1⅞d. to 2d. Heavy oils, in bulk, 2⅝d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 9½d. to 1s. 10d.; west coast, 1s. 8½d. to 1s. 9½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is again very firm; and considerable business has been done for delivery to the end of this year and the first few months of next. Actual Beckton is quoted £13; outside London makes, £12 15s.; Hull, £13 5s.; Liverpool, £13 7s. 6d. to £13 8s. 9d.; Leith, £13 10s.; and Middlesbrough, £13 5s.

DEMPSTER'S IMPROVED
CARBURETTED WATER-GAS PLANTS
DELLWIK SYSTEM.

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RECENT ORDERS for Carburetted Water-Gas Plants
NEW MILLS U.D.C.
TYLDESLEY U.D.C.
TAR CARBURETTING PLANTS in successful operation at
PRESCOT GAS-WORKS,
SNODLAND GAS-WORKS.

Full Particulars from—

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MANCHESTER.

COAL TRADE REPORTS.

Northern Coal Trade.

Both production and distribution of coal have been interfered with by the labour dispute of the last few days; but in the northern coalfield the output is nearly normal again. In the steam coal trade, best Northumbrians are from 10s. 7d. to 10s. 9d. per ton f.o.b.; second-class steams from 9s. 3d. to 9s. 6d.; and steam smalls from 5s. to 6s. These prices, however, are subject to fluctuations due to the changes in the labour position. In the gas coal trade, the changes are not so rapid. Durham gas coals are generally steady; and the output is fair. Second-class coals are from 9s. 6d. per ton f.o.b.; best Durhams are from 10s. 3d. to 10s. 4½d.; and "Wear specials," from 10s. 9d. to 10s. 10½d. Some of the largest of the gas-coal producers have given wage-advances to the seamen, and their steamers are now running freely. There is little decided as to contracts; but several of moderate size are in course of negotiation. One, for about 20,000 tons at near 9s. per ton f.o.b., is settled for Belgium; and another, for about 9000 tons, for the same country, is reported for a higher quality at about 9s. 7½d. In coke, the market is quiet. Good gas coke is quoted at 14s. to 14s. 6d. per ton f.o.b. Tyne or Wear.

Scotch Coal Trade.

The most that can be said of trade is that it has not gone back during the week. There is very little that is encouraging in current business, except the view be taken that any further movement downwards is inconceivable, and therefore upwards is expected. The prices now quoted are: Ell, 8s. 3d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. The shipments for the week amounted to 332,651 tons—a decrease of 40,027 tons upon the previous week, but an increase of 11,820 tons upon the corresponding week last year. For the year to date, the total shipments have been 7,603,112 tons—an increase of 9446 tons over last year.

Aldershot Electricity Supply and the Gas Company.—In the course of a Local Government Board inquiry into an application by the Aldershot Urban District Council for sanction to borrow £2500 for extensions of plant at the electricity works, the Clerk (Mr. W. E. Foster) said the Council were advised by their Committee that if they had oil-engines they could produce electricity more cheaply. They had very strong opposition in Aldershot, where there was a large Gas and Water Company who supplied the whole district around; and they were at the present time enabled to furnish gas in Aldershot at the unusually low rate of 2s. 6d. per 1000 cubic feet. Though the cheapness of gas benefited the general public, it affected the working of the Council's electricity supply to a certain extent. But for all this they found their supply was gradually increasing. The Council fully realized that it behoved them to make every effort to produce electricity as cheaply as they could, and to give as efficient a supply as possible, in order to compete with such a formidable opponent.

Fylde Water Supply.—The Fylde Water Board, on the report of their Engineer, Mr. Edward Garlick, are considering the question of constructing a new trunk water-main. The last trunk main laid for the storage reservoirs was one 24 inches diameter in 1899; and in the past ten years the number of consumers and average daily consumption have increased from 21,082 and 3,118,292 gallons to 29,105 and 4,355,681 gallons.

Alexandra Water Company.—In their report for the year ended the 31st of March, the Directors of this Company comment favourably on the satisfactory and continued progress of the business. They state that the total number of consumers was 27,989, compared with 25,295 in the previous year; representing an increase of 2694. The total receipts, which amount to £124,969, show an increase of £7041, and the working expenses an increase of £1058. The Directors have written off £10,780 as depreciation—making, with the amount already written off, a total of £66,680; and they recommend the shareholders to fix the dividend at 9s. 3d. per share. With the interim dividend of 2s. 6d. paid on Dec. 15, this makes a dividend for the year of 11s. 9d.

Fraserburgh Gas Arbitration Award.—In "Notes from Scotland" in the last number, reference was made to this matter, and some round figures were given. We learn from the Gas Company's Manager and Secretary (Mr. H. G. Ritchie) that the findings of the Oversman (Mr. A. Yuill, of Dundee) issued to the parties, but not yet final, are as follows: The Town Council are to pay for the Company's undertaking, business, works, &c., £26,961; and for stocks taken over, £647—total, £27,608. As mentioned last week, the Company retain the profits to, and the accounts outstanding on, April 30 last; the total amounting to £1415. The Arbitrator for the Company was Mr. Adam MacPherson, of Kirkcaldy; for the Town Council, Mr. W. B. M'Lusky. of Perth.

Birmingham Water Supply.—In his epitome of the accounts for the year to March 31, Mr. T. H. Clare, the City Treasurer of Birmingham, says the revenue account of the water undertaking for 1910-11 shows a balance of income in excess of expenditure of £213,671, carried to profit and loss account. The profit and loss account shows a loss of £75,083, which has been provided for as follows: Contribution from the borough rate, £65,000; transfer from capital under section 22 of the Birmingham Corporation Water Act, 1902, £7131; balance carried forward, £2952. The amount of capital expended during the year under the 1892 Act was £13,280. The total expenditure on capital account to March 31 under the 1875 and 1879 Acts was £2,097,860; and under the Act of 1892, £6,218,849. The gross amount of loans negotiated, including annuities, under the 1875 and 1879 Acts, was £2,097,860; and under the 1892 Act, £6,232,500. The amount provided from revenue for redemption of debt during the year, under the 1875 and 1879 Acts, was £23,574; and under the 1892 Act, £5028. The gross amount provided for redemption of debt to the end of 1910-11, under the 1875 and 1879 Acts and the 1892 Act, was £270,141. The balance of loans to be provided for, under the 1875 and 1879 Acts, was £1,865,710; and under the 1892 Act, £6,194,509.

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THE continued prosperity of our business is due to the popularity of our goods and the hearty co-operation which we receive at the hands of Gas Undertakings throughout the country. Although we have had large sales this season we can still deliver promptly. We are now on our SECOND MILLION and solicit a continuance of your valued support.

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"GASAPPARATUS, LONDON."

The RICHMOND GAS STOVE & METER CO, Ltd.,
WARRINGTON and LONDON.

Domestic Hot-Water Heating by Gas.—At Northampton, last Wednesday, before the fitters and staff of the Gas Company, a lecture on domestic hot-water work was delivered by Mr. Frederick Dye, on behalf of Messrs. John Wright and Co. The meeting was presided over by the Engineer and Manager of the Company (Mr. G. S. Eunson), who was supported by Mr. W. J. Barker, the chief of the staff. The audience numbered about fifty. The subject was dealt with fully, both generally and in relation to the use of gas-boilers; and a demonstration of the action of a thermostat was given.

Diss Water Supply.—An inquiry was held at Diss last Tuesday, by Dr. A. W. Brightmore, into an application by the Urban District Council for sanction to borrow money for purposes of water supply. There was no opposition to the scheme, for which it is calculated that about £6500 will be required. Mr. W. H. Booth, the Engineer, stated that the existing water supply was entirely from wells. It was proposed to lay 5 miles of mains, and erect a water-tower to hold 30,000 gallons. Boring to a depth of 400 feet they got well into the chalk, and tests showed that there was a plentiful supply of water. The scheme would provide 20 gallons per head per day for 4000 people.

Okehampton Gas Company.—At the recent annual meeting of this Company, the report showed that the total revenue was £1440 and the expenditure £1062—a difference of £378. The sum of £75 was written off for depreciation, and £21 was allowed for bad debts; leaving a profit of £282. The balance brought forward increased this to £299, which was available for distribution. The Directors recommended the declaration of a dividend of 6¼ per cent., and the placing of £70 to the reserve fund, making it £200. A suggestion was made that only 5 per cent. should be paid and the price of gas (4s. 7d.) reduced. It was not, however, acted upon; and the report and accounts were adopted.

Paignton Water Undertaking.—Members of the Paignton District Council last Tuesday paid their annual visit to the water-works, which are situated at Holne Moor, on the southern border of Dartmoor. They were accompanied by the members of the Brixham District Council, as well as by Mr. J. C. Hawkins (the Water Engineer), Mr. J. R. Mill (the Clerk), and other officials of the Paignton Council. In the course of the proceedings, there was a luncheon; and Mr. W. J. Ham (the Chairman of the Paignton Council), who presided, referred to the assistance given by the Brixham and Teignmouth Councils in the passing of the Bill which the Paignton Council have promoted this session for the extension and improvement of the water-works. He said that when the second main was laid, they would be in a position to improve the supply. Mr. F. W. Puddicombe (the Chairman of the Water Committee) stated that the duplicate main would be 12 miles in length, and an additional installation of Candy filters was also to be put down. The water-works was a good asset for Paignton; and if they were going to sell it, there would be plenty of companies who would pay twice the amount the works cost the Council. The Clerk remarked that they already had an offer. Mr. Puddicombe said they did not want any offers; they were content with things as they are.

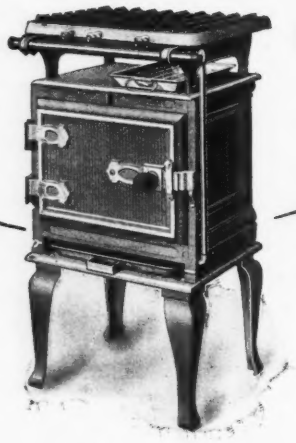
Improved Street Lighting by Gas for Kensington.—The London County Council will to-day be asked to agree to an application from the Kensington Royal Borough Council for sanction to the borrowing of £3800 (repayable within five years, on the instalment system) for the improvement of street lighting by gas within the borough, by the substitution, for Kern burners, of inverted incandescent burners. The Finance Committee make the proposal.

Kinder Valley Water-Works of the Stockport Corporation.—The Water Committee of the Stockport Corporation hope to complete by next month the construction of their new works in the Kinder Valley, upon which so much money has been spent in consequence of the first part of the scheme having to be abandoned owing to the failure to find a safe foundation for the huge masonry dam that was to be built. Under the original scheme, three reservoirs were to be constructed; and the contract for the one at Kinder was let for £248,000 in the latter part of 1902. The limit depth of excavating for the dam was 50 feet; but, owing to the nature of the strata, consisting mostly of shale, it was found necessary to go still lower. When the excavating had been carried to a depth of 70 feet, greater difficulties were encountered; and the Council decided upon a modified scheme, and the building of an earth dam, which is now practically completed. It stretches across the Kinder Valley; and the embankment is said to be the highest of its kind in existence. It measures 125 feet from the level of the stream to the top, and is 1150 feet in length. The holding capacity of the reservoir is 600 million gallons; and the filter plant put down will deal with about 5 million gallons per day. The modified scheme, which was commenced in 1907, was estimated to cost £244,000; and the work has been carried out by administration.

A New Reservoir for Cardiff.—A large party journeyed from Cardiff to Llwyn-On last Wednesday to witness the laying of the keystone of the first masonry work in connection with the reservoir embankment to be constructed there for the Cardiff Corporation water supply. The ceremony was performed by Alderman C. H. Bird, Lord Mayor of Cardiff, and Chairman of the Water Committee, who was presented with a silver trowel by Mr. Louis P. Nott (the Contractor), and with an ivory-handled mallet by Mr. C. H. Priestley (the Water Engineer). The reservoir is the last of the series of three to be constructed by the Cardiff Corporation under their Act of 1886, and will more than double Cardiff's present water storage. Originally designed for a capacity of 640 million gallons, it was subsequently decided to make fuller use of the capacities of the drainage area; and when the reservoir is completed, it will have a capacity of over 1200 million gallons, whereas the total storage at all the present existing reservoirs is 1065 million gallons. The drainage area comprises 10,400 acres; but the compensation water to be allowed to the Taff Fawr River (the waters of which are impounded for the scheme) is 7¾ million gallons a day. The contract was let to Mr. Nott at £201,000 (though the total cost, from road diversions, &c., will be about £300,000) on Nov. 28 last; and the work, which will necessarily occupy a long time, was commenced some six months ago.

The "SHAMROCK."

GAS COOKER.



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London Office and Show-Rooms: 18, HOLBORN VIADUCT, E.C. | *Australasian Agent:* P. H. HOPKINS, 20, LOFTUS STREET, SYDNEY, N.S.W.

The European Gas Company, Limited, have declared a final dividend of 12s. 6d. per share, free of tax.

Under date of June 30, Messrs. John Aird and Sons have issued an intimation that, in consequence of the death of the late Sir John Aird, Bart., the firm have incorporated their business with that of the Westminster Construction Company, Limited, of 22, Queen Anne's Gate, Westminster, S.W. (of which the late Sir John was Chairman), under the style of "Airds Limited."

In the second week of February a temporary show-room was opened in Stafford by the Cannon Ironfoundries, Limited, for the purpose of canvassing the district for cookers, &c., and the result has been that 300 cookers and 41 grillers have been placed out. The Gas and Electricity Department of the Corporation (of which Mr. W. M. Valon is the Engineer and Manager) have now 4560 gas-cookers in use, with a total of 5426 consumers. This ranks among the highest proportions in the country.

Coalexld Limited, of Lancaster, have taken out a patent (No. 14,634) for a machine for the purpose of measuring the given weights of chemicals into packets for the various sizes of charges of coal. The machine was designed to minimize labour in charging retorts with the chemicals. They have lately been experimenting with a machine on the same principle, but of a larger capacity, for the purpose of weighing or measuring 28 lbs. of coke for the paper-bag delivery; and we are informed that the result of the provisional testing has been so successful that a permanent fully equipped machine for power use is now being built. The average result of weighings by the machine is stated to be more accurate than when hand weighing is in operation. The speed of the machine can be arranged so as to fill three or four bags per minute; and it should prove useful in works in which the paper-bag system of sale has been adopted.

To commemorate the Jubilee of Messrs. George Glover and Co., Limited, the Chelsea employees had on the 24th ult. a special outing and dinner at Great Yarmouth, where they were joined by the firm's employees from the branch works in Leeds and Manchester. In responding to the toast of "Success to the Firm," the Managing-Director (Mr. James W. Glover), who presided, gave some interesting reminiscences of his association half-a-century ago with Dr. George Glover, who superintended the construction of the test gasholders for the Standards Department of the Board of Trade; these instruments being necessary under the Sale of Gas Act, which in 1859, for the first time, fixed a standard measure for gas. In 1861, Dr. Glover took out a patent for, and started the manufacture of, dry gas-meters, which at the International Exhibition in 1862 gained the medal for "superior construction and sound workmanship." The Chairman also referred to the firm's recent successes with their "Standard" automatic attachment. He was supported by his son, Mr. Albert W. Glover, by the representatives of the firm (Messrs. Hudson, Lyon, and Laughton), and by other members of the staff.

APPLICATIONS FOR LETTERS PATENT.

13,912.—Dempster, R., and Sons, Limited, and Toogood, H. J., "Vertical gas-retorts." June 12.
13,919.—Welsh, E. W., "Opening and shutting the doors of coal-trucks." June 12.
13,963.—Dutchman, E., Fawcett, A. S., Jessop, S., and Travis, W. J., "Gas-burners." June 12.
14,003.—Skinner, R. J., "Automatically controlled gas-valve." June 13.
14,020.—Heskett, T. J., "Working gas-furnaces." June 13.
14,061.—Matthews, W. C., "Mantles" June 13.
14,065.—Clarke, H., and Campbell, J. A., "Discharge of tar and liquor from hydraulic mains." June 13.
14,079.—Koller, K., "Gas-producers." June 13.
14,115.—Jennings, F. W., "Control valves." June 14.
14,131.—Rigby, T., and Testrup, N., "Supply of heat in wet carbonizing installations." June 14.
14,137.—Sperryn, G. N., and Wood, W. H., "Gas-burners." June 14.
14,183.—Heath, A. W., and Harrison, C. H., "Globe or shade holders." June 15.
14,218.—Fimon, C. F., "Automatic recording apparatus for measuring gaseous fluids." June 15.
14,230.—Rysman, E. R., "Acetylene generators." June 15.
14,231.—Seyd, F. O., "Gas illuminated advertising apparatus." June 15.
14,232.—Bingham, C., "Gas-generators." June 15.
14,277.—Wing, J., jun., and Burnett, J. R., "Gas-heated furnaces." June 16.
14,394.—Breeden, J., and Co., Limited, and Breeden, F., "Gas-lamps." June 17.
14,427.—Boult, A. J., "Control of gas-valves." A communication from H. H. Kanugy and G. W. de Smet. June 17.
14,440.—Burstall, F. W., "Treating gases in the production of sulphate of ammonia." June 19.
14,530.—Opitz, C. J., "Expansion joints." June 19.
14,548.—Barker, J., "Spirally-guided gasholders." June 20.
14,552.—Geairns, A. D., and Boothroyd, A., "Conveying hot coke." June 20.
14,560.—Short, A. J., "Gas-pressure governors." June 20.
14,616.—Piper, E. J., "Acetylene generator." June 20.
14,628.—Teed, F. L., Sulman, H. L., and Picard, H. F. K., "Recovery of sulphur from gases." June 20.
14,629.—Tillé, G., "Joints for pipes." June 20.
14,762.—Chance, K. M., and British Cyanides Company, Ltd., "Manufacture of cyanide." June 21.
14,767.—Kunze, E. A., "Gas-generators." June 21.
14,774.—Dor-Delattre, E., "Gas-producers." June 21.

PARKINSON'S POINTS.

IMMEDIATE DELIVERY.

INTERCHANGEABLE PARTS.

PERFECT FITTING RENEWALS.

THE PARKINSON STOVE COMPANY, Ld.

BIRMINGHAM AND LONDON.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

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DRAUGHTSMAN. Box 5953, Willing's, Strand, W.C.
FOREMAN. No. 5421.

Situations Wanted.

CLERK. No. 5420.
ENGINEER (DESIGNING AND CONSTRUCTING). Z., care of Streets, Cornhill.

Plant, &c. (Second-Hand), For Sale.

GASOMETER, &c. Great Central Railway. Tenders by July 7.
METER AND RETORT-HOUSE GOVERNOR. Newcastle (Staffs.) Gas Department.
RETORT MOUTHPIECES, PIPES, VALVES, &c., AND STEAM ENGINE. Smethwick Gas-Works.

Patent Licence, &c.

OBTAINING GAS FROM TAR IN GAS PRODUCER PLANT. Gardner and Son, Fleet Street, E.C.

Meeting.

EUROPEAN GAS COMPANY. London Offices, July 11, Two o'clock.

Stocks and Shares.

BROADSTAIRS GAS COMPANY. By Auction. July 6.
EAST GRINSTEAD GAS AND WATER COMPANY. July 11.
GRAVESEND AND MILTON WATER COMPANY. July 11.
REDHILL GAS COMPANY. July 11.
SOUTHEND WATER COMPANY. July 11.
SUTTON GAS COMPANY. July 11.
WEST SURREY WATER COMPANY. By Tender. July 17.

TENDERS FOR

Coal and Cannel.

BURY CORPORATION. Tenders by July 10.
GLOSSOP GAS COMPANY. Tenders by July 8.
RADCLIFFE AND PILKINGTON GAS COMPANY, Tenders by July 12.

Fire-Clay Goods.

LISBURN URBAN DISTRICT COUNCIL. Tenders by July 20.

Iron and Steel Work, required in the Construction and Erection of Various Plant.

LISBURN URBAN DISTRICT COUNCIL. Tenders by July 20.

Meters.

BELFAST GAS DEPARTMENT. Tenders by July 18.

Pipes, &c.

CHORLEY GAS DEPARTMENT. Tenders by July 11.

Tar.

HEREFORD GAS DEPARTMENT. Tenders by July 10.
HEYWOOD GAS DEPARTMENT. Tenders by July 18.

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending July 1. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar, crude	per ton	—	18/6 21/3	19/6 23/-	19/- 22/-	19/- 22/-	—
Pitch	"	38/- 38/6	36/3	37/6	36/6	36/-	36/6
Benzol, 90%	per gallon	—	-/9½	-/9	-/9¼	-/9¼	-/9½
Benzol, 50-90%	"	—	-/9⅜	-/9¼	-/8¼	-/8⅜	—
Toluol, 90%	"	—	-/9⅞	-/10	-/10	-/10	-/10
Crude naphtha, 30%	"	—	-/3⅞	-/4	-/3½	-/3½	—
Light oil, 50%	"	—	-/3½	-/3⅝ -/4	-/3½	-/3⅛ -/3¼	—
Solvent naphtha, 90-160	"	—	-/10	-/10	-/10	-/10½	-/11
Heavy naphtha, 90-190	"	—	-/11	-/11½	-/11¼	-/11⅜	-/11
Creosote in bulk	"	-/2½	-/2⅛	-/2	-/2⅛	-/2 5/16	-/1⅞
Heavy oils	"	—	-/2½ -/2⅝	-/2¼	-/2⅜	-/2⅝	-/2⅜
Carbolic Acid, 60's	"	—	1/10	1/10	1/7	1/7½	1/10
Naphthalene, crude drained salts	per ton	—	43/9	41/3	47/6	48/9	—
" pressed	"	—	60/-	63/-	60/-	60/- 72/6	—
" whizzed	"	—	—	—	71/3	60/- 75/-	60/-
Anthracene	per unit	-/2	-/1½	-/1½	-/1¼	-/1¼	—

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 16.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	82—85	−1	5 17 8	4,940,000	Stk.	May 12	9	Imperial Continental .	184—186	−1	4 16 9
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	95—97	..	4 2 6	1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
200,000	5	May 12	7	Bombay, Ltd. . . .	6¼—6⅜	..	5 3 8	200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c. .	119—121	..	4 19 2
40,000	5	"	7	Do. New, £4 paid .	5¼—5⅜	..	4 17 5	561,000	Stk.	Feb. 24	10	Liverpool United A. .	214—216	..	4 12 7
50,000	10	Feb. 24	15	Bourne-) 10 p.c. . .	28½—29¼	..	5 1 8	718,100	"	"	7	Do. B. .	163—165	..	4 4 10
311,810	10	"	7	mouth Gas) B 7 p.c. .	16⅝—16⅞	..	4 3 0	306,083	"	June 30	4	Do. Deb. Stk.	102—104*	..	3 16 11
75,000	10	"	6	and Water) Pref. 6 p.c.	14¾—15	..	4 0 0	75,000	5	June 15	6	Malta & Mediterranean	4⅜—4⅞	..	6 3 1
380,000	Stk.	"	12½	Brentford Consolidated	257—262	..	4 15 5	560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100—102	..	4 18 0
330,000	"	"	9½	Do. New . . .	203—208	..	4 11 4	250,000	100	"	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
50,000	"	"	5	Do. 5 p.c. Pref. .	122—124	..	4 0 8	541,920	20	May 31	3½	Monte Video, Ltd. . .	12⅜—13¼	..	5 5 8
206,250	"	June 15	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10	1,775,892	Stk.	Feb. 24	4⅛	Newc'tle&G'tesh'd Con.	102½—103½	..	4 4 6
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217—220	..	5 0 0	529,705	Stk.	June 30	3½	Do. 3½ p.c. Deb.	87½—88¾*	..	3 19 1
246,320	"	"	8	Do. A Ord. Stk. .	157—160	..	5 0 0	55,940	10	Mar. 10	7	North Middlesex 7 p.c.	15—16	..	4 7 6
490,000	20	Apl. 12	11⅞	British	44—45	+½	5 4 6	300,000	Stk.	Apl. 27	8	Oriental, Ltd. . . .	137—139	..	5 15 1
120,000	Stk.	June 30	4	Do. 4 p.c. Deb. Stk.	94—96*	..	4 3 4	60,000	5	Apl. 12	8	Ottoman, Ltd. . . .	6⅞—7¼	..	5 10 4
109,000	"	Feb. 10	6	Bromley, A 5 p.c. . .	116—118	..	5 1 8	31,800	53	Feb. 24	13	Portsea Island A . .	135—140	..	4 18 4
165,700	"	"	4½	Do. B 3½ p.c. . .	87—89	..	5 1 2	60,000	50	"	13	Do. B . .	—	..	—
82,278	"	"	5½	Do. C 5 p.c. . .	106—108	..	5 1 10	100,000	50	"	12	Do. C . . .	120—125	..	4 16 0
55,000	"	June 30	3½	Do. 3½ p.c. Deb. .	82—84*	..	4 3 4	114,800	50	"	10	Do. D and E.	—	..	—
250,000	Stk.	"	4	Buenos Ayres 4 p.c. Deb.	95—97*	..	4 2 6	398,490	5	May 31	8	Primitiva Ord. . . .	7⅝—7¾	..	5 3 3
100,000	10	—	—	Cape Town & Dis., Ltd.	2¼—3⅛	−⅛	—	796,980	5	June 30	5	Do. 5 p.c. Pref. .	5¼—5⅜*	..	4 10 11
100,000	10	—	—	Do. 4½ p.c. Pref. .	6—6½	..	—	488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—	312,650	Stk.	June 30	4	River Plate 4 p.c. Deb.	95—97*	..	4 2 6
100,000	Stk.	June 30	4½	Do. 4½ p.c. Deb. Stk.	86—88*	..	5 2 3	250,000	10	Mar. 24	9	San Paulo, Ltd. . . .	20—21	+½	4 5 9
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord. . .	109—111	..	4 10 1	115,000	10	"	6	Do. 6 p.c. Pref. .	12—12½	..	4 16 0
1,513,280	Stk.	"	5/9/4	Commercial 4 p.c. Stk.	114—116	..	4 14 3	125,000	50	July 1	5	Do. 5 p.c. Deb. .	49—50*	..	5 0 0
560,000	"	"	5½	Do. 3½ p.c. do..	108—110	..	4 16 11	135,000	Stk.	Mar. 24	10	Sheffield A	235—237	..	4 4 5
475,000	"	June 15	3	Do. 3 p.c. Deb. Stk.	75½—77½	..	3 17 5	209,984	"	"	10	Do. B	235—237	..	4 4 5
800,000	Stk.	May 31	4	Continental Union, Ltd.	92—95	..	4 4 3	523,500	"	"	10	Do. C	234—236	..	4 4 9
200,000	"	"	7	Do. 7 p.c. Pref.	134—136	..	5 2 11	70,000	10	June 15	7	South African . . .	8½—9¼	..	7 7 4
492,270	Stk.	—	5½	Derby Con. Stk. . . .	122—124	..	4 8 9	6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
55,000	"	—	4	Do. Deb. Stk. . . .	104—105	..	3 16 2	1,895,445	"	Jan. 13	3	Do. 3 p.c. Deb.	80—82	..	3 13 2
148,995	"	Apl. 12	5	East Hull 5 p.c. Ord. .	—	..	—	209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154—156	..	5 2 7
840,150	10	Jan. 27	10	European, Ltd. . . .	19—20	..	5 0 0	605,000	Stk.	Feb. 24	5⅜	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 13 6
16,179,445	Stk.	Feb. 24	4⅜	Gas-) 4 p.c. Ord. . .	106½—107½	+¼	4 7 0	60,000	"	"	5	Do. 5 p.c. Pref. .	118—120	..	4 3 4
2,600,000	"	"	3½	light) 3½ p.c. max. .	85—87	..	4 0 6	117,058	"	Jan. 13	5	Do. 5 p.c. Deb. Stk.	123—125	..	4 0 0
4,062,235	"	"	4	and) 4 p.c. Con. Pref.	103—105	..	3 16 2	502,310	Stk.	May 12	5	Southampton Ord. . .	109—111	..	4 6 11
4,531,705	"	June 15	3	Coke) 3 p.c. Con. Deb.	78½—80½	..	3 14 6	120,000	Stk.	Feb. 10	7	Tottenham) A 5 p.c. .	147—150	..	4 13 4
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	95—97	..	5 3 1	483,940	"	"	5½	and) B 3½ p.c. .	116½—118½	..	4 12 10
82,500	"	"	6½	Do. do. 5 p.c.	—	..	—	149,470	"	June 15	4	Edmonton) 4 p.c. Deb.	96—98	..	4 1 8
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17½—17⅝	..	6 3 11	182,380	10	June 15	8	Tuscan, Ltd.	8¼—9¼	..	8 13 0
131,000	Stk.	Mar. 10	7⅜	Ilford A and C . . .	147—150	..	4 18 4	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98*	..	5 2 0
65,780	"	"	5¼	Do. B	118—121	+1	4 17 1	236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115—117	..	4 5 6
65,500	"	June 30	4	Do. 4 p.c. Deb. . . .	94—96*	..	4 3 4	255,636	Stk.	Feb. 24	6¾	Wands-) B 3½ p.c. . .	141—143	..	4 14 5
								85,766	"	June 30	3	worth) 3 p.c. Deb. Stk.	71—73*	..	4 2 2

Prices marked * are "Ex. div."

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O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

TAR WANTED.

THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

ENQUIRIES SOLICITED.

FOR Gas-Works Plant of Every Description; also SULPHATE OF AMMONIA and SULPHUR RECOVERY PLANTS,
C. & W. WALKER, LIMITED,
DONNINGTON, NEWPORT, SALOP.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, June 20, p. 801.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 years. References given to Gas Companies.

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
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ANY QUANTITY. ANY PORT. ANY STATION

DONALD M'INTOSH,
110, CANNON STREET, LONDON.

DUTCH OXIDE OF IRON.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

THE First Dutch Bogore Co., Ltd.,
NYMEGEN, HOLLAND.
General Manager (for England and Wales)—
W. T. P. CUNNINGHAM,
71, Arcadian Gardens, Wood Green, LONDON, N.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

GAS OILS.

MEADE-KING, ROBINSON, & CO., Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone. 480 HOLBORN. Telegrams: "Improvably, London."

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

AMMONIACAL Liquor wanted.
CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

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BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

COAL TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

SULPHURIC ACID — Specially prepared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

WANTED—Tar and Ammoniacal Liquor. Any Quantity.
GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS, BOLTON." Telephone 0848.

FOR Instructions on Polishing and Cleaning Gas-Cookers and Gas-Fittings, read Canning Handbook on Polishing, Electro-Plating, and Lacquering. Fully illustrated. Price 2s. 3d., post free; abroad, 2s. 6d.
W. CANNING AND CO., BIRMINGHAM, and 18 to 20, St. John's Square, Clerkenwell, LONDON, E.C.

CLERK, with several years' experience in large Gas Company, desires CHANGE. Expert Shorthand-Typist. Sound knowledge of Accountancy and Book-keeping. Experience in Drafting Reports, &c. Capable correspondent. Age 26. Highest Credentials.
Address, No. 5420, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN English Engineer having Special Experience in DESIGNING and CONSTRUCTING one of the most Modern Types of RETORT CHARGING MACHINES, also Patentee of important Improvements, is open to an ENGAGEMENT to Design and to Superintend the Construction of Stoking Machinery, either at Home or Abroad.
Address, "Z," care of STREETS, 30, CORNHILL, E.C.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS, ELEVATING, CONVEYING, and TELPHERAGE PLANTS, also STOKING MACHINERY, Rose Mount Iron-Works, Elland.

EXPERIENCED Draughtsman, well up in practical Details of Coal and Coke Conveyors and Telpher work, required for Westminster Office.

Apply, by letter, stating Age, Experience, and Salary required, to Box 5953, Willing's, 125, Strand, W.C.

FOREMAN wanted, immediately, in a 90 Million Cubic Feet Gas-Works (South-West of England). Must be good Carbonizer and Fitter. Able and Experienced in the Control of Workmen. Carburetted Water Gas and Sulphate of Ammonia made on the works. House, with Garden, Gas, and Coal provided free. Profit Sharing and non-contributory Pension Scheme in Existence.

Apply, stating Age, Experience, and Wages required, with *copies* of Three recent Testimonials, to No. 5421, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE.

RETORT Mouth-pieces and Fittings of Four through Beds in Settings of Eights, consisting of 64 Mouthpieces 22 in. by 15 in. with Tangye Self-sealing Lids, and 64 Ascension Pipes Taper 6-inch to 5-inch. Dry Mains, Valves, Bridge Pipes, and other Connections. All in good working condition. Also one STEAM ENGINE, Horizontal, High-Pressure, 14-inch bore by 20-inch stroke, to work with 80 lbs. Steam pressure. Splendid Condition.

A low price to clear will be taken for the whole or part of the above.

Apply to Vincent Hughes, Engineer, Gas-Works, Smethwick.

THORP'S Recording Meter For Sale. Capacity up to 15,000 Cubic Feet per hour, 9-inch Disc Valves, Bye-Pass Valve, and Connections; also COWAN'S RETORT-HOUSE GOVERNOR; two 10-inch Valves and Connections, in excellent Condition.

For further Particulars, Apply to Frank L. Wimhurst, General Manager, Corporation Gas Department, Newcastle, Staffs.

FOR SALE.

DISUSED GASOMETER.

THE Directors of the Great Central Railway are prepared to receive TENDERS for the Purchase of a GASOMETER, now standing on the Company's premises at New Holland, where it can be inspected upon Application.

The Plant comprises:—

GASOMETER or BELL, about 29 ft. 9 in., diameter by about 12 ft. deep, built up of plates riveted together, 2 ft. by 4 ft., the crown being of similar plating, approximately ¼ inch thick.

Four CAST-IRON COLUMNS, having Channel Guides for the Guide Rollers.

Four COLUMN HEAD BRACKETS and Pulleys, with the counterbalance weights and chains.

The Columns are secured together at the top by means of four Tie Rods, having right and left hand adjusting screws.

There are four Guide Brackets with Rollers on the Gasometer, also four Channel Guides on the wall below water level.

The level of the water in the Gasometer stands 1 ft. 7 in. below ground level.

Form of Tender with Conditions of Sale may be obtained upon Application to the undersigned, or to the Stores Superintendent, Great Central Railway, Gorton, near Manchester, and must be returned to the Secretary, in envelope marked "Tender for Gasometer," by 9 a.m., Friday, July 7, 1911.

O. S. Holt,
Secretary.

Marylebone Station, London, N.W.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the Purchase of Surplus TAR.

Specification and Form of Tender may be obtained from the Gas Manager.

Sealed Tenders, endorsed "Tar," to be sent to me not later than Tuesday, July 18, 1911.

By order,
Geo. G. Bouchier,
Town Clerk.

Municipal Buildings, Heywood,
June 27, 1911.

LISBURN URBAN DISTRICT COUNCIL.

THE above Council are prepared to receive TENDERS from Experienced Firms for the following:—

Contract No. 2.—The Sundry CAST-IRON, STEEL, and FIRE CLAY WORK required in the Construction and Erection of a RETORT STACK, RETORT STACK MOUNTINGS, CONDENSERS, EXHAUSTER and ENGINE, BOILER, WASHER, WASHER-SCRUBBER, PURIFIERS, METER, GOVERNOR, ROOFS, and CONNECTIONS.

The Specification and Drawings may be seen at the Town Hall, Lisburn, and at the Offices of the Engineers, Messrs. Thomas Newbigging and Son, 5, Norfolk Street, Manchester.

Copies of the Bill of Quantities may be obtained from the latter on deposit of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Tenders, addressed to the undersigned, Town Hall, Lisburn, and to be endorsed "Contract No. 2," are to be sent so as to reach him not later than noon on Thursday, the 20th day of July, 1911.

The Council do not bind themselves to accept the lowest or any Tender.

T. Wilson,
Town Clerk.

Town Hall, Lisburn,
July 4, 1911.

COUNTY BOROUGH OF BURY.

THE Corporation of Bury are prepared to receive TENDERS for the Supply of about

40,000 Tons of GAS COAL,
1200 Tons of BOILER SLACK,
500 Tons of BURGY,
400 Tons of HOUSE COAL.

Forms of Tender and Conditions may be obtained on Application to the Engineer and General Manager, Gas Works, Bury.

Tenders, duly sealed and endorsed, to be Delivered to the Town Clerk, Bury, not later than Monday, July 10, 1911.

CITY AND COUNTY BOROUGH OF BELFAST.

THE Gas Committee invite Tenders for the Supply of DRY METERS (Ordinary and Prepayment) for One Year from the 1st of October, 1911.

Conditions and Forms of Tender may be had on Application to the Engineer and Manager at the Gas-Works.

Tenders, endorsed "Tender for Meters," should be lodged in the Office of the undersigned not later than July 13, 1911.

The lowest or any Tender not necessarily accepted.

R. Meyer,
Town Clerk.

CITY OF HEREFORD.

TENDERS FOR TAR.

THE Gas Committee invite Tenders for the Purchase of their Surplus TAR for Twelve Months from July 30 next.

The Tar will be loaded into buyer's Tank Waggons, at the Gas-Works.

Further Particulars from the undersigned.

Tenders, addressed to the Chairman of the Gas Committee, Town Hall, will be received up to the 10th of July.

W. W. Townsend,
Engineer and Manager.

RADCLIFFE AND PILKINGTON GAS COMPANY.

TENDERS FOR COAL.

THE Directors invite Tenders for a Twelve Months' Supply of COAL.

Particulars may be obtained from the undersigned, by whom Tenders will be received until Wednesday, July 12.

James Braddock,
Manager and Secretary.

Gas Offices, Radcliffe,
June 29, 1911.

BOROUGH OF CHORLEY.

(Gas Department.)

THE Chorley Corporation invite Ten- DERS from Makers of STEEL TUBES for the Supply and Delivery of

About 1000 Yards 2-inch internal bore Tubes, and
About 2000 Yards 3-inch internal bore Tubes.

Specification and any other Details can be obtained on Application to Mr. J. W. Allin, Gas Engineer, Chorley.

Tenders, endorsed "Steel Tubes," must be delivered to me not later than Tuesday, July 11, 1911.

The Corporation do not bind themselves to accept any Tender.

JNO. MILLS,
Town Clerk.

Town Hall, Chorley,
June 30, 1911.

THE Directors of the Glossop Gas Company invite TENDERS for the Supply, during the Year commencing August 1, 1911, of about 6000 Tons of Good GAS COAL and 500 Tons of CANNEL, which must be Delivered, Carriage Paid, at the Great Central Railway Station, Glossop.

Forms of Tender may be obtained at the Company's Office.

Sealed Tenders, Specifying the Description of the Coals and the pit from which they are to be raised, must be sent to the Chairman of the Company not later than Saturday, the 8th of July next.

The Directors do not bind themselves to accept the lowest or any Tender.

J. Sidebottom,
Secretary.

Gas Offices, Glossop,
June 26, 1911.

EUROPEAN GAS COMPANY, LIMITED.

NOTICE is Hereby Given that the ANNUAL GENERAL MEETING of the Shareholders will be held on Tuesday, the 11th day of July next, at Two p.m. precisely, at the Offices, Finsbury House, Blomfield Street, London, pursuant to the Regulations of the Company.

The Directors who retire by rotation are H. C. Smith, Esq., and R. Hesketh Jones, Esq., and the retiring Auditors are J. Reeson, Esq., and H. J. Luff, Esq., who, being eligible for re-election, offer themselves accordingly.

The Accounts to be submitted to the Shareholders will be open for inspection at the Company's Offices on and after the 3rd of July next.

Notice is Also Given, that the TRANSFER BOOKS WILL BE CLOSED from the 15th to the 31st of July next, both days inclusive.

By order of the Board,
W. B. Brady,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., June 30, 1911.

In accordance with Clause 48 of the Company's Articles of Association, "The bearer of a share warrant may, on depositing his warrant at the Office not less than forty-eight hours before the time of holding any meeting of the Company, with a statement in writing of his name and address, be present at such meeting and vote thereat in respect of the shares included in such warrant."

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to Messrs. A. & W. Richards, at 18, Finsbury Circus, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF £5000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK,
AND
500 £10 NEW ORDINARY FIVE PER CENT. MAXIMUM SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the Auctioneers, 18, Finsbury Circus, E.C.

By order of the Directors of the
GRAVESEND AND MILTON WATER-WORKS COMPANY.

NEW ISSUE OF 500 £20 FOUR-AND-A-HALF PER CENT. PREFERENCE SHARES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the Auctioneers, as above.

By order of the Directors of the
SUTTON GAS COMPANY.

NEW ISSUE OF £6500 FOUR-AND-A-HALF PER CENT. MORTGAGE DEBENTURES.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the Auctioneers, as above.

By order of the Executors of the late W. V. K. Stenning, Esq., and another Owner.
EAST GRINSTEAD GAS AND WATER COMPANY.
52 £10 "A" SHARES AND £316 "A" STOCK,
AND
94 £10 "B" AND "C" SHARES.

REDHILL GAS COMPANY.
54 £5 ORDINARY SHARES,
AND
£100 ORDINARY "B" STOCK.

MESSRS. A. & W. RICHARDS will SELL THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, July 11, at Two o'clock, in Lots.

Particulars of the Auctioneers, as above.

To Investors.
BROADSTAIRS GAS COMPANY.

ISSUE OF NEW CAPITAL.

MESSRS. HINDS & SON have been favoured with instructions from the Directors of the above Well-Known and Highly Successful Local Company to SELL BY PUBLIC AUCTION On Thursday, July 6, 1911, at the Bull and George Hotel, High Street, Ramsgate, at Three o'clock in the Afternoon, exact time,

£3500 NEW ORDINARY "D" STOCK,
Offered in 175 Lots of £20 each, and
£1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK,
Offered in 50 Lots of £20 each.

The Stock offered for Sale forms part of an issue of new Capital which is required for the purpose of extending the Buildings and Plant of the Company owing to their large increase in Business. These will be erected upon their new site at St. Peter's near the Electric Power Station.

The Business of the Company has practically Doubled in the last Ten years.

Particulars and Conditions of Sale and further Information may be obtained of Mr. F. Higginson, the Manager, Gas Offices, Alexandra Road, Broadstairs, or at the Offices of the Auctioneers, 57, Queen Street, Ramsgate.

WEST SURREY WATER COMPANY.

NOTICE is hereby given that the Directors of the above Company intend to offer for SALE BY TENDER 300 ORDINARY SHARES of £10 each, nominal value (Maximum Dividend 7 per cent. per Annum), in lots of Five or more Shares.

The Maximum Dividend of 7 per cent per Annum has been paid for the past eleven years upon the 7 per cent. Ordinary Share Capital, and the Maximum Dividend of 10 per cent. per Annum has been paid for the past four years upon the 10 per cent. Ordinary Share Capital.

Under the provisions of the Trustee Act, 1893, the Debenture Stock or Preference Shares of the Company may be considered a Trust Security.

The District supplied by the Company comprises Walton, Oatlands, Hersham, Weybridge, Addlestone, Byfleet, and Chertsey in Surrey, and Shepperton in Middlesex; Cobham in Surrey and Littleton in Middlesex are also embraced in the Company's Parliamentary Limits.

Tenders, to be in a Sealed Cover, addressed to the Directors of the West Surrey Water Company, at the Office of the Company, will be received not later than the 17th day of July, 1911.

Forms of Tender and Particulars and Conditions of Sale may be obtained from the Secretary at the Offices of the Company, 38, Parliament Street, Westminster, London, S.W.

By order of the Directors,
Walter Colbrook,
Secretary.

June 13, 1911.